AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

JANUARY 15, 1959

Features • • •

Missiles to Pace Aircraft Industry in 1959

Previews and Reviews of the Industries

Average Automobile Uses 51.28 Lb of Aluminum

Ultrasonic Welding for Automotive Uses

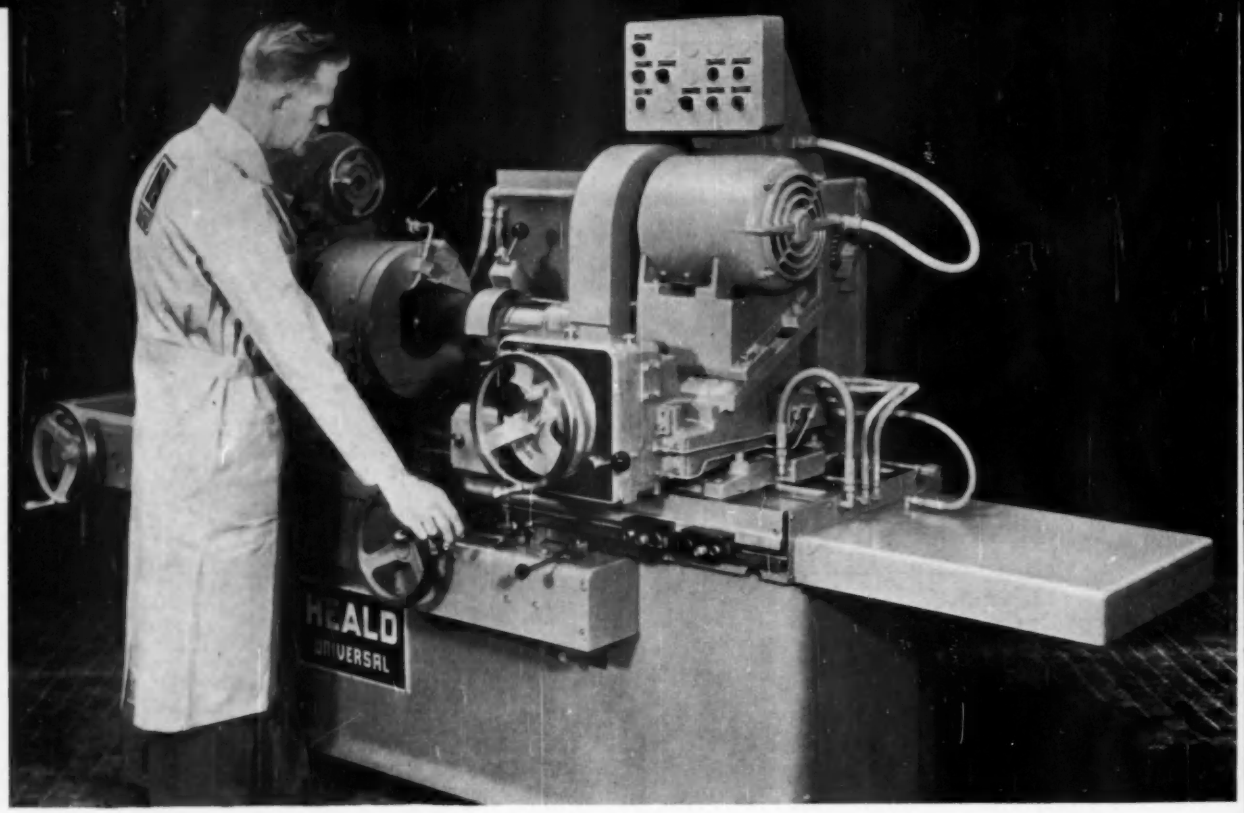
Details of the New Allis-Chalmers Diesels

Volkswagen's Automated Press and Welding Lines

COMPLETE TABLE OF CONTENTS, PAGE 3

Automotive and Aviation Manufacturing

ENGINEERING • PRODUCTION • MANAGEMENT



Presenting the Heald Model 273-A NEW UNIVERSAL

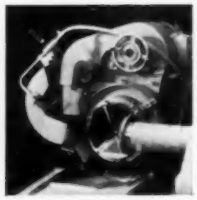
a completely new machine with

1959 PERFORMANCE

and a 1947 PRICE TAG







. . . for I. D., O. D. and Rotary Surface Grinding

THIS is the machine that "couldn't be built" — a better, more *versatile* general purpose grinder that costs about *half* as much as comparable machines today, and *less* than similar machines (with fewer features) cost in 1947!

Here are just a few of its outstanding features:

Hydraulic Anti-Friction Ways — table and cross slide are supported on "pockets" of pressurized oil. A quarter-pound force moves the 1800-pound table.

20-Inch Table Travel — more than in any previous standard base Heald universal grinder.

Workhead Swivels 90 Degrees — permitting rotary surface grinding as well as I.D. and O.D. grinding.

Three Wheelhead Positions — standard, 2" forward or 7½" forward for greater grinding versatility.

Vari-speed Workhead Drive — infinitely variable from 150 to 450 rpm.

Swing Inside Standard Guard — 12".

Standard O.D. Grinding Capacity — 12".

Accuracy — holds tolerances within .0001" in routine production and within .000050" in special cases.

Ask your Heald engineer for the complete UNIVERSAL story. Then compare its performance and cost with *any other machine* available today. And if you have a Heald toolroom grinder that's 10 to 30 years old, you can now replace it profitably — at a cost that's *too low* to pass up.

HEALD®

It PAYS to come to Heald

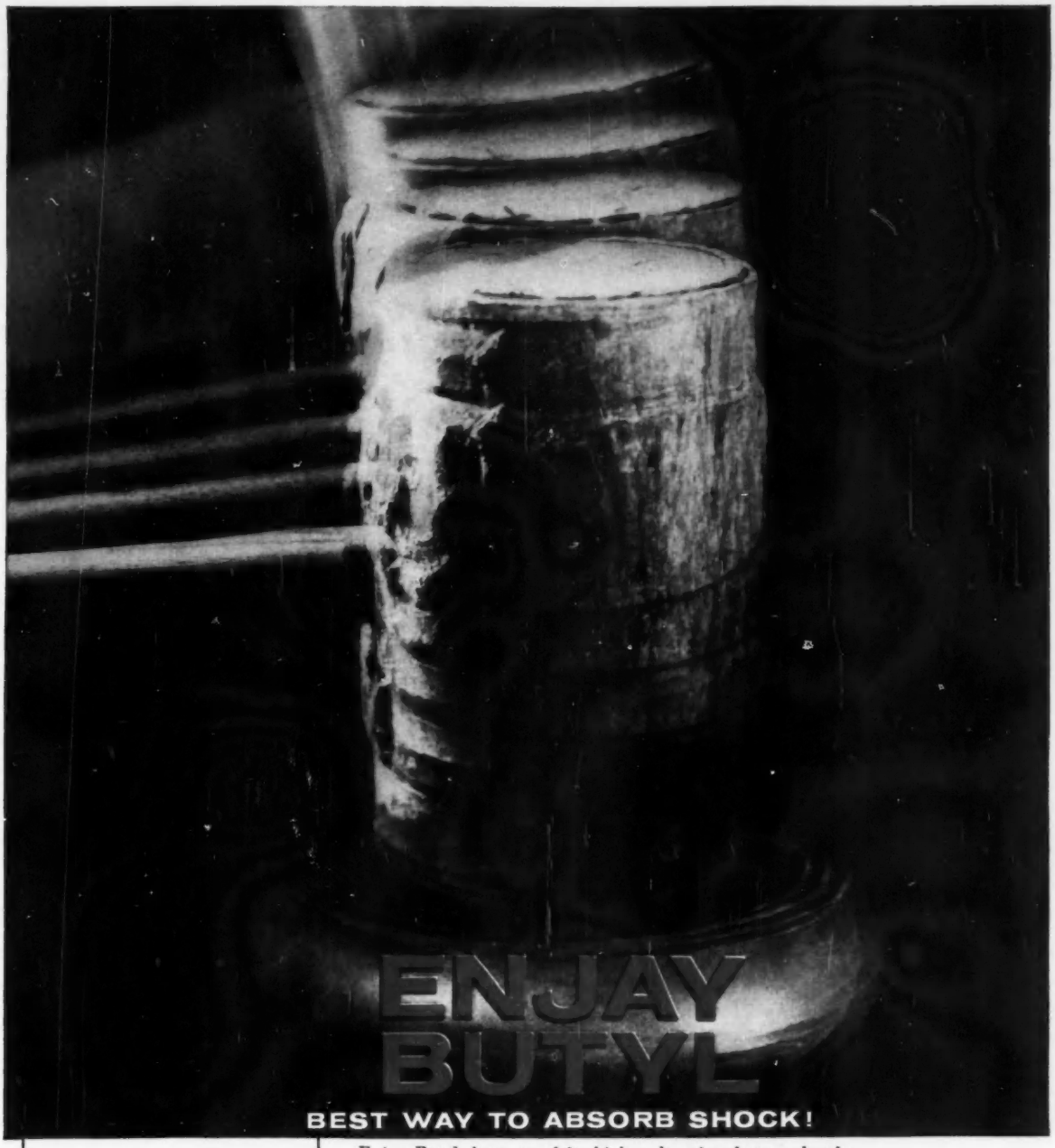
THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

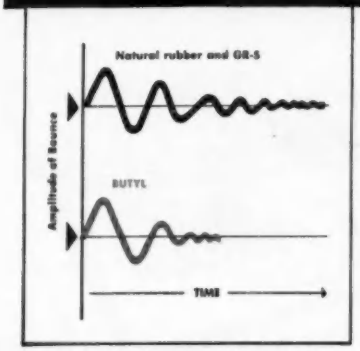
Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

Circle 101 on Inquiry Card for more data



BEST WAY TO ABSORB SHOCK!



Butyl's superior shock absorption characteristics reduce amplitude of bounce in much less time as compared with other rubbers.

Enjay Butyl, because of its higher damping factor, absorbs shock energy *more* completely than any other rubber. Through simple variations in compounding or processing, you can build the right degree of resiliency for your requirements. Butyl is the ideal rubber for motor mounts, load cushions, sound deadener insulation, axle and body bumpers—and other shock, noise and mechanical vibration applications.

Butyl *also* offers outstanding resistance to weathering and sunlight . . . chemicals . . . heat . . . abrasion, tear and flexing . . . unmatched electrical properties and impermeability to gases and moisture.

Find out how this versatile rubber can improve your product. Call or write the Enjay Company, today!

ENJAY® BUTYL

ENJAY *Pioneer in Petrochemicals*

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

Visit the Enjay Exhibit, Booth No. 43 & 44, at the SAE Engineering Display, January 12th-16th

Circle 104 on Inquiry Card for more data



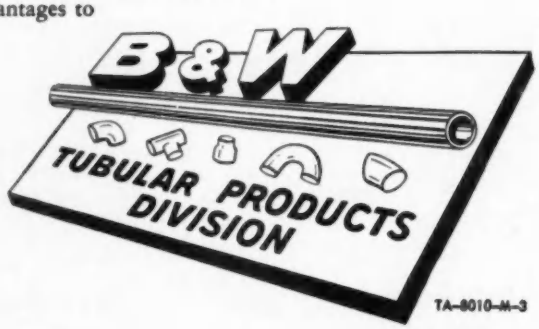
"B&W Tubing

assures easy fabrication–top quality operation for our hydraulic cylinders

As a hydraulic engineer, I'm interested in getting components that cut my fabrication work to a minimum without loss of end-use quality. That's why I always specify B&W Seamless Mechanical Tubing. It's *consistently* of the highest quality . . . and needs very little reworking."

This particular case history, documented in B&W's files, is only one example of the many successful applications of B&W Mechanical Tubing. Because of the high-precision standards to which it is produced, B&W Mechanical Tubing is received from the mill in a condition that often represents 90% of the unit for which it is intended. Advantages to engineers and craftsmen include high strength-to-weight ratio, as well as ability to assume almost any design shape without loss of structural advantages, material, weight and space savings.

B&W Mechanical Tubing is produced to order, to special sizes, shapes, finishes and analyses and to the mechanical properties needed in the end-use application. Ask for Mr. Tubes, the B&W specialist—he can help you simplify tube fabrication problems—or write for Bulletin TB-361. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



TA-8010-M-3

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

JANUARY 15, 1959 VOL. 120 No. 2

Features • • •

▼ **Accelerated Missile and Space Programs**
Here is a brief review of the achievements of the aircraft and missile industry in 1958, as well as an outline of prospects for 1959. Page 52.

▼ **Industry Reviews and Previews**
What's the outlook for metals, rubber, petroleum, plastics, construction equipment, etc., in the year ahead? Here is a summary of the views of top men in each field. Page 54.

▼ **Computer Speeds Up Engineering**
Schwitzer Corp. is using a digital computer to solve engineering equations in a fraction of the time it would take to compute them manually. Page 57.

▼ **Average Car Uses 51 Lb of Aluminum**
The use of aluminum in 1959 passenger cars promises to surpass all previous records, according to this Alcoa survey. Page 58.

▼ **Ultrasonic Welding for Automotive Use**
A recent display of the latest in ultrasonic welding equipment points to many possible applications in the automotive industry. Page 58.

▼ **British Tractor Has Hydrostatic Drive**
Design features of a hydrostatic transmission and a unique method of track suspension are detailed here. Page 62.

▼ **Liquid-Cooled Brake for Aircraft**
A new liquid-cooled brake for high-performance aircraft dissipates heat ten times faster than conventional brakes, according to test results. Page 63.

▼ **Intercooling of Supercharged Engines**
How an intercooler is used to boost the output of a supercharged engine by lowering the temperature of the compressed air is told here. Page 64.

▼ **Burman Integral Power Steering**
A new British-built power-assisted steering system is entirely contained within the steering box without external rams or linkage. Page 65.

CONTINUED NEXT PAGE

Copyright 1959 by Chilton Company

MEMBER
National Business Publications, Inc.
Society of Business Magazine Editors
Audit Bureau of Circulations

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Company, Chestnut & 56th Sts., Phila. 39. Second Class Postage Paid at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. Subscription price: To manufacturers in and suppliers to the automotive industries in the U. S., U. S. Possessions and Canada, $2.00 per year; $3.00 for 2 years. All Others, $10.00 per year. Single copies, 50¢. Statistical Issue, $1.00.

AUTOMOTIVE INDUSTRIES

Features • • • continued

▼ **Volkswagen Press and Welding Shop**

A key project in Volkswagen's expansion program is the press and welding shop at Wolfsburg. Here is a detailed look at the equipment in use for car roofs and door panels. First of a two-part article. Page 66.

▼ **28 New Product Items And Other Features, Such As:**

Business pulse, airbriefs, construction equipment industry, news of machinery industries, and industry statistics.

News Previews • • •

Aluminum Engine Readied For Chrysler Small Car 37
British Engine Firm To Get Oliver Motor Line 37
Dodge Truck Demand For Sixes Tops 58 Percent 37
1958 Production: 4,240,206 Passenger Cars 38
Four-Cylinder Engine Powers A-C Model D Grader 38
Makers Interested In Variable Ratio Steering 39
Chevrolet's Sattler Sees 25 Percent Truck Rise 39
Kaiser To Use Alfa Body For Argentine Car 40
Los Angeles, Detroit Join Battle Over Smog 40
Willys Gets Order For Cargo-Personnel Carriers 40
Leonard Raymond Elected SAE President 41
Republic To Build Jet Drone 42
Grumman To Build $4 Million Avionics Facility 42
Allison And Cornell Team Up 43
GM To Repay $9.9 Million on AF Contracts 44

Departments • • •

Calendar Of Coming Events 8
News Of The Automotive And Aviation Industries 37
Men In The News 45
Construction Equipment Trends. By Kenneth Rose 69
Industry Statistics 70
Machinery News. By Charles A. Weinert 74
Airbriefs. By David A. Partridge 76
The Business Pulse 78
New Automotive And Aviation Products 80
New Plant And Production Equipment 82
On Our Washington Wire 92
Shorties 114
More Government Contract Awards 116
Free Literature ..... **At Back Of This Issue**
Advertiser's Index 148

AUTOMOTIVE INDUSTRIES COVERS

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS & COMPONENTS • ACCESSORIES • PRODUCTION, SERVICE and MAINTENANCE EQUIPMENT • ENGINEERING • PRODUCTION • MANAGEMENT

EDITORIAL STAFF

JAMES R. CUSTER, Editor
H. H. ROBERTS, Engineering Editor
ANDREW SHEARER, Market Research Editor
ROBERT P. HOMER, Editorial Production Mgr.
DAVID A. PARTRIDGE, Aviation Editor
MARCUS AINSWORTH, Statistical Editor
HAROLD M. NELSON, Specifications Editor
SAMUEL CUMMINGS, News Editor
HOWARD KOHLBRENNER, Art Director
JANE LIVINGSTON, Products Guide Editor
Assistants—Inza Sherburne, Marion March

DETROIT
Joseph Geschelin, Detroit Editor
Hugh C. Quinn, Detroit News Editor

PHILADELPHIA & NEW YORK
Charles A. Weinert, Eastern Editor

WASHINGTON
George H. Baker, Washington Editor
Ray M. Stroupe, Wash. News Editor
Neil R. Regelmbal, Wash. News Editor

CHICAGO
Kenneth Rose, Mid-West Editor

LOS ANGELES
R. Raymond Kay, Pacific Coast Editor

BERN
Robert S. Braunschweig, European Correspondent

LONDON
David Scott, British Correspondent

• • •

Paul Wooton, Washington Member, Editorial Board
Robert Gunning, Readability Consultant

As part of its worldwide automotive and aviation news coverage AUTOMOTIVE INDUSTRIES is serviced by United Press International and has editorial correspondents in major United States and Foreign industrial centers.

BUSINESS DEPARTMENT

John C. Hildreth, Jr., Publisher
John F. Pfeffer, Asst. to Publisher
E. H. Miller, Advertising Mgr.
James Cadigan, Circulation Mgr.
Norman Lloyd, Marketing Mgr.
John H. Kofron, Research Director

REGIONAL MANAGERS

CHICAGO—Carl A. Zehner
360 North Michigan Ave.
Chicago 1, Ill.
Phone RAndolph 6-2166

CLEVELAND—George Kilbride
930 B. F. Keith Bldg.
Cleveland 15, Ohio
Phone SUperior 1-2860

DETROIT—Thomas L. Pickrell
103 Pallister Ave.
Detroit 2, Mich.
Phone TRinity 3-7800

DALLAS—William J. Smyth
189 Meadows Bldg.
Dallas 6, Tex.
Phone EMerson 8-4751

PHILADELPHIA and NEW YORK —Nelson W. Sieber
Chestnut and 56th Sts.
Philadelphia 39, Pa.
Phone SHerwood 8-2000
and
100 East 42nd St.
New York 17, N. Y.
Phone OXford 7-3400

SAN FRANCISCO— Frank W. McKenzie
1355 Market St.
San Francisco 3, Calif.
Phone UNderhill 1-9737

LOS ANGELES—L. H. Jackson
198 S. Alvarado St.
Los Angeles 57, Calif.
Phone DUnkirk 7-4337

NEW YORK—Robert P. Hulbert
100 East 42nd St.
New York 17, N. Y.
Phone OXford 7-3400

ATLANTA—John W. Sangston
1371 Peachtree St., N.E.
Atlanta 9, Ga.
Phone TRinity 6-4110

CHILTON COMPANY OFFICERS AND DIRECTORS

Joseph S. Hildreth—Chairman of Board
G. C. Buzby—President
P. M. Fahrendorf, L. V. Rowlands, Robert E. McKenna, George T. Hook—Vice Presidents
William H. Vallar—Treasurer
John Blair Moffett—Secretary
Maurice E. Cox, Frank P. Tighe, Everit B. Terhune, Jr., John C. Hildreth, Jr., Russell W. Case, Jr.

Stanley Appleby—Comptroller

AUTOMOTIVE INDUSTRIES is one of the Publications Owned by CHILTON COMPANY. Executive Offices, Chestnut & 56th Sts., Philadelphia 39, Pa., U. S. A.

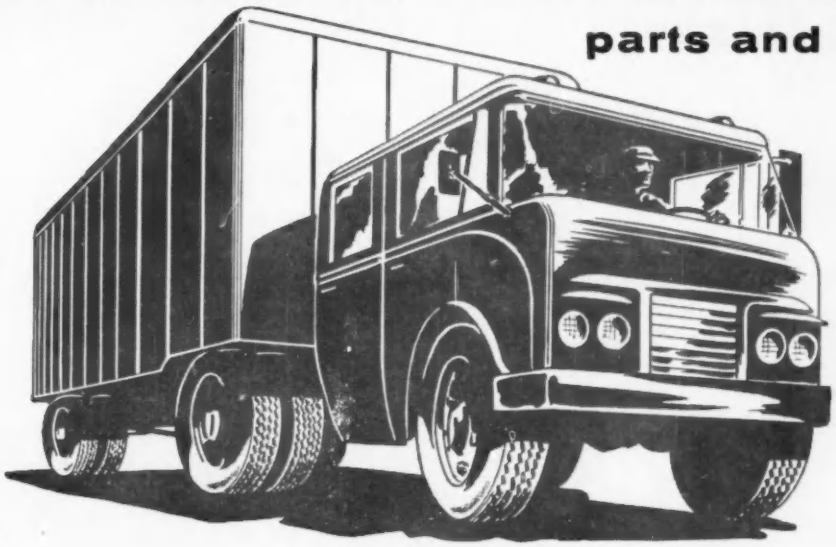
REDUCE TRUCK CAB WEIGHTS as much as 40%

REDUCE TOOLING COSTS 80%

with

MOLDED FIBER GLASS

parts and assemblies







"A pound saved earns a dollar a year," say the trucking companies.

And MOLDED FIBER GLASS parts save pounds and pounds . . . they weigh 40% less than metal parts. That's one reason why so many truck and trailer manufacturers are starting to use MOLDED FIBER GLASS molded pieces and flat sheet for body parts and assemblies . . . from fenders to complete, assembled cabs.

Other important reasons are:

Tooling costs for MOLDED FIBER GLASS parts are 80 to 85% less than for metal;

Time required for tooling is 50% less;

Complete MOLDED FIBER GLASS cabs—as assembled in Molded Fiber Glass Body Company plants—cost little or no more than contoured steel cabs;

MOLDED FIBER GLASS body parts do not rust or corrode . . . do not dent . . . provide sound and temperature insulation;

If and when major damage occurs (which would badly distort metal), MOLDED FIBER GLASS can be easily repaired.

MOLDED FIBER GLASS offers design possibilities not obtainable with metal . . . and MOLDED FIBER GLASS executives are always available to discuss your designs. Just write or telephone for information and literature.

GREATEST NAME IN REINFORCED PLASTICS — MOLDED FIBER GLASS

MOLDED FIBER GLASS is the exclusive trade name for fiberglass reinforced plastic products custom molded by the affiliated Molded Fiber Glass Companies.

MOLDED FIBER GLASS BODY COMPANY

4611 BENEFIT AVENUE, ASHTABULA, OHIO



how much Dust can a filter collect?

UP TO 99.99%

if it uses WESTERN FELT!

Such efficiency is possible in a Hersey reverse-jet filter with particle size of 5 microns and a pressure drop of ½ inch of water.

Felt can be used to filter solids from solids, solids from liquids, or solids from gases. It is used effectively in fuel filters, air filters, chemical filters, respirators, or dust collectors.



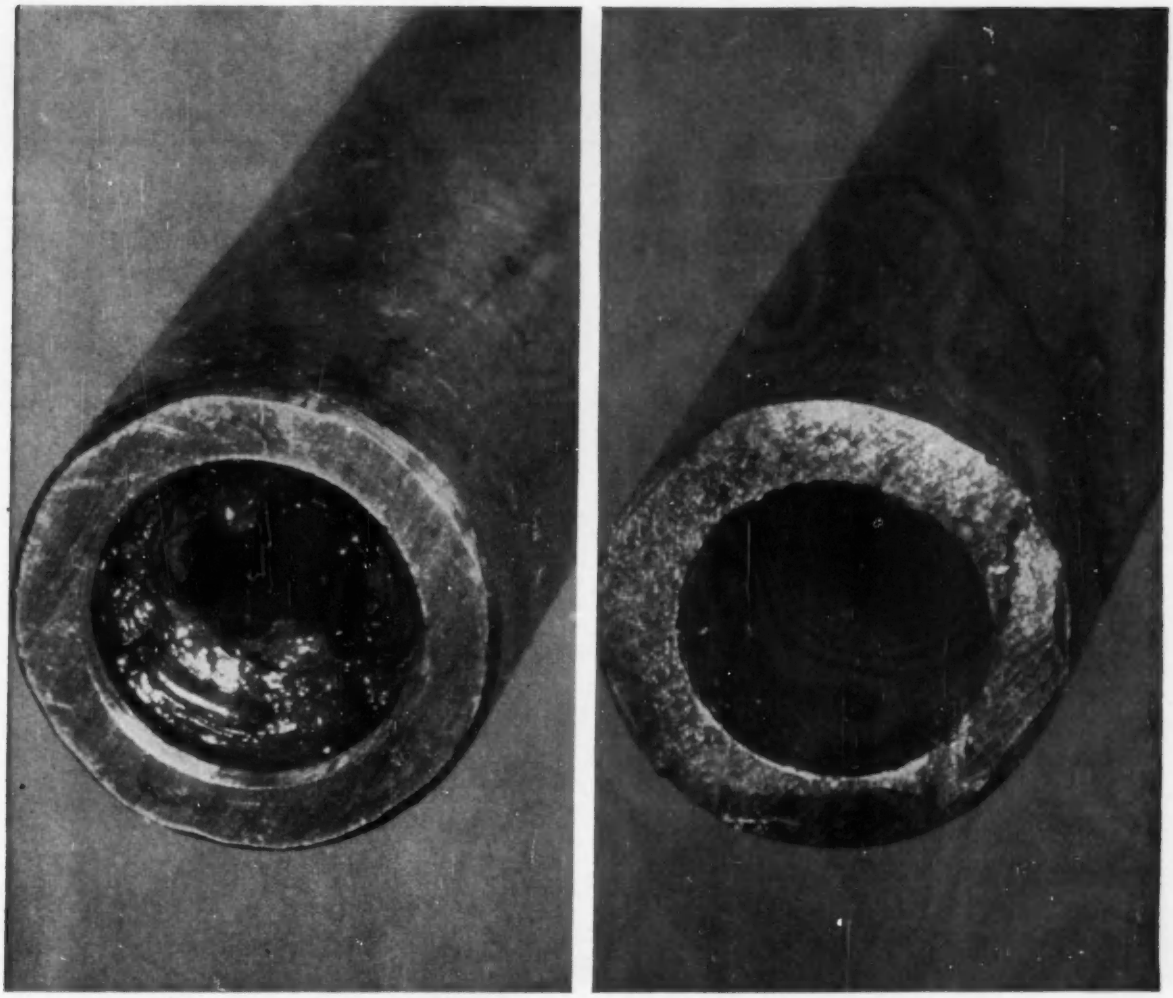
Microscopic barbs on the live fibers of Felt make felt the ideal filtering medium. These scales collect and hold dust particles. They also encourage "build-up" or caking which actually increases filter efficiency. At the same time, their natural interlocking action holds fibers tightly together, through years of flexing.

For helpful engineering information on filtration felts, write

WESTERN Felt WORKS

Dept. A
4021-4139 Ogden Ave.
Chicago 23, Ill.

MANUFACTURERS AND CUTTERS OF WOOL FELTS



This sludge-clogged hydraulic line . . . looked like this, after cleaning with a Sunvis 700 oil.

With Sunvis 700 oils, you can clean hydraulic systems and keep them clean

Sludge, caused by high temperatures, and by water, dirt, cutting oils, paint, packing, and by many other contaminants, clogs lines and cuts efficiency.

Sunvis* 700 oils keep these contaminants in suspension, and carry them away to the filters, thereby keeping systems clean and preventing costly shutdowns. In fact, many seriously fouled systems can be cleaned and kept clean permanently by a switch to Sunvis 700 oil. A single charge of Sunvis 700 oil can keep even a continuously contaminated system running smoothly for months, often *years*.

Your Sun man knows Sunvis 700 oils inside out. He has facts, figures, and case histories that prove their quality... quality that means *money in your pocket.* Call him in soon. Or write to Dept. AA-1.

Industrial Products Department

SUN OIL COMPANY, Phila. 3, Pa.

SUNOCO

*TRADEMARK © 1958 SUN OIL COMPANY

In Canada: Sun Oil Company Limited, Toronto and Montreal



An entire **NEW** Plant devoted exclusively to the making of **Precision BALLS**

... the best—Strom combines 40 years' experience with the most modern methods and machinery to produce the world's finest balls.

Balls of Chrome, Commercial-type Carbon and Stainless Steels, Brass, Bronze, Monel Metal, and Special Materials

Catalog and Prices on Request

Strom STEEL BALL CO.

Erwin, Tennessee · Telephone ERwin 2-1141

Pacific Coast Representative: R. J. SCHENK, 716 South Main Street, Santa Ana, California

Southwestern Representative: E. E. GRAHAM & Co., 3701 Navigation Blvd., Houston 3, Texas

Chicago Representative: ROBERT YOUMANS, 6110 West 26th Street, Chicago 50, Illinois

8548

CALENDAR

OF COMING SHOWS AND MEETINGS

49th Annual National Motor Boat Show, New York Coliseum, New York, N. Y. ..... Jan. 16-25

Chicago Automobile Show, International Amphitheatre, Chicago, Ill. ..... Jan. 17-25

American Society of Lubrication Engineers, First Annual Gear Symposium, Morrison Hotel, Chicago, Ill. ..... Jan. 26-27

Institute of Aeronautical Sciences, 27th annual meeting, Sheraton-Astor Hotel, New York, N. Y. Jan. 26-29

Plant Maintenance & Engineering Show, Public Auditorium, Cleveland, O. ..... Jan. 26-29

Society of Plastics Engineers, 15th annual technical conference, Hotel Commodore, New York, N. Y. ..... Jan. 27-30

5th Annual Midwest Welding Conference, sponsored by Armour Research Foundation and Chicago Section of American Welding Society, at Illinois Institute of Technology, Chicago, Ill. ..... Jan. 28-29

First International Symposium on Nuclear Fuel Elements, sponsored by Columbia University and Sylvania-Corning Nuclear Corp., at Columbia University, New York, N. Y. ..... Jan. 28-29

American Society for Testing Materials, Committee D-2 meeting, Sheraton-Jefferson Hotel, St. Louis, Mo. ..... Feb. 1-6

Automotive Accessories Manufacturers of America, 32nd annual exposition, New York Coliseum, New York, N. Y. ..... Feb. 2-5

14th Reinforced Plastic Division Conference, sponsored by Society of Plastics Industry, Inc., Edgewater Beach Hotel, Chicago, Ill. ..... Feb. 3-5

Industrial Management Engineering Conference, Illinois Institute of Technology, Metallurgical and Chemical Engineering Bldg., 10 W. 33rd St., Chicago, Ill. .... Feb. 5-6

Amsterdam Automobile Show, Amsterdam, Holland ..... Feb. 5-14

Computer and Data Processing Conference, Dept. of Industrial Engineering, Purdue University, Purdue, Ind. ..... Feb. 12-13

International Automotive Service Industries Show, Navy Pier, Chicago, Ill. ..... Feb. 18-21

Institute of Aeronautical Sciences, Flight Propulsion Meeting (classified), Hotel Carter, Cleveland, O. ..... Mar. 5-6

Western Space Age Conference and Exhibit, Great Western Exhibit Center, Los Angeles, Calif... Mar. 5-7

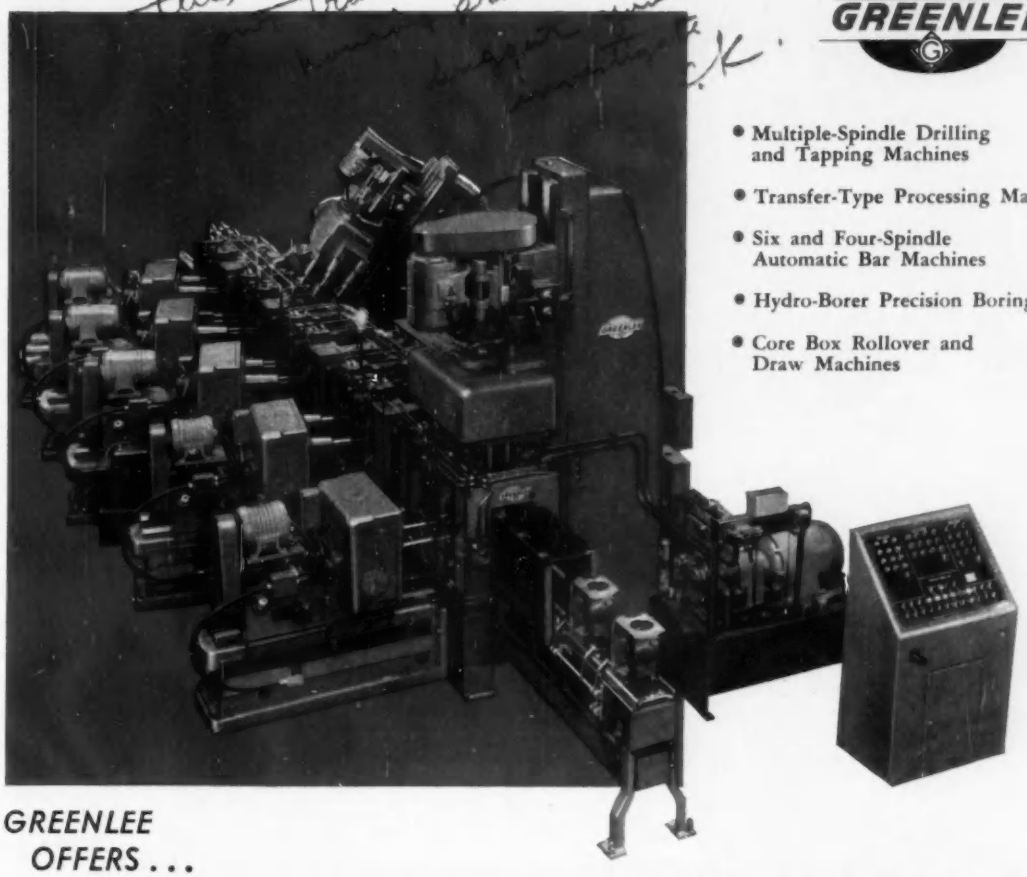
Steel Founders' Society of America, 58th annual meeting, Drake Hotel, Chicago, Ill. ..... Mar. 9-10

Circle 109 on Inquiry Card for more data

Circle 110 on Inquiry Card for more data →

Sam: this may solve transmission problems. Let's discuss when you return. O.K.

PRODUCTION MACHINERY
GREENLEE



- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines
- Core Box Rollover and Draw Machines

GREENLEE OFFERS . . .

COOPERATION FOR AUTOMATIC PRODUCTION

The emphasis is on cooperation at Greenlee. Your ideas are added to Greenlee's. One idea sparks another. The result . . . the creation of machines that will meet your requirements efficiently . . . economically . . . now and in the future. Top-flight Greenlee engineers help you avoid costly mistakes. Their thinking is sound . . . respected. Call Greenlee. Let them give you the complete story on cooperation for automatic production.

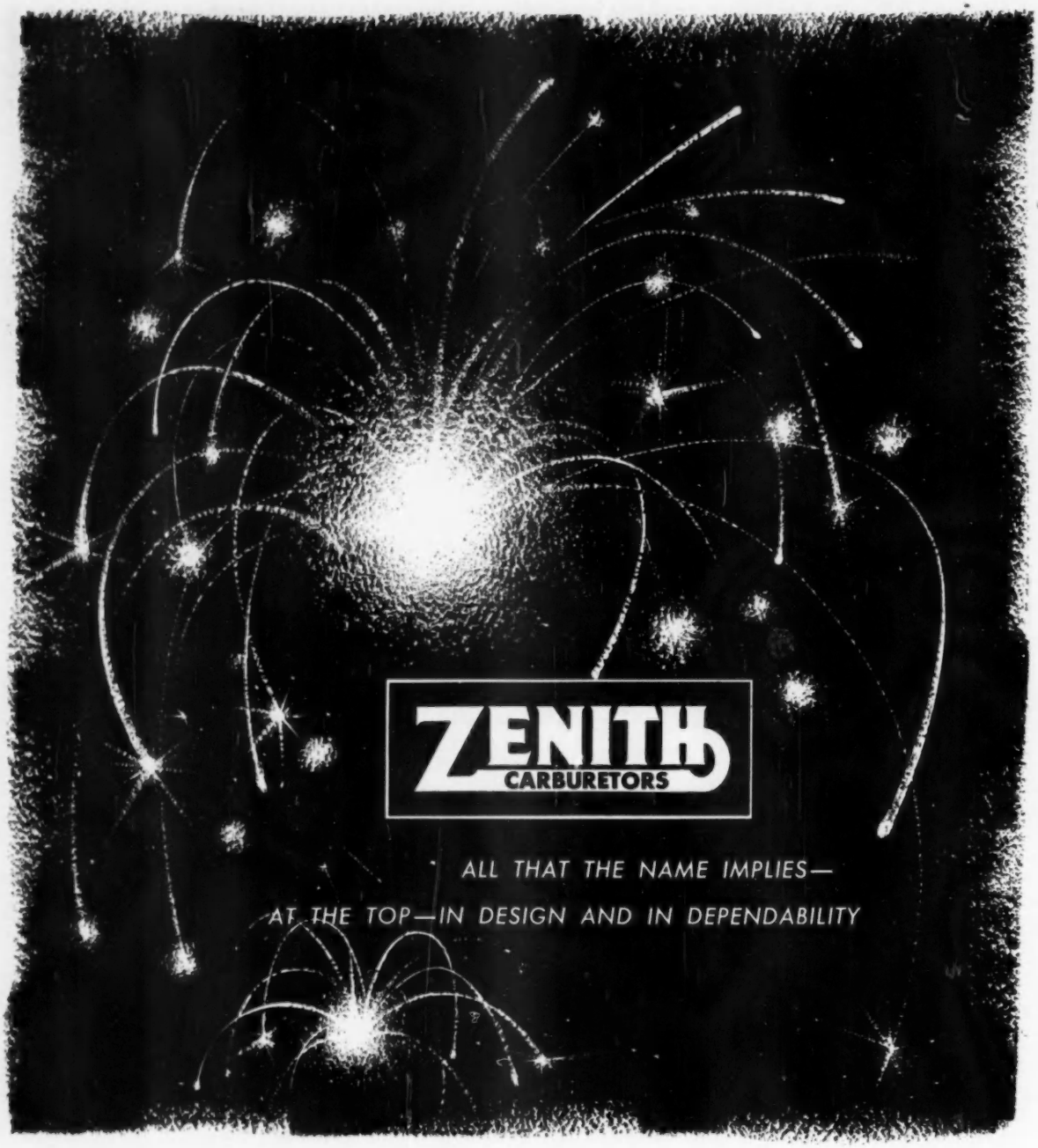


MACHINES DESIGNED WITH THE FUTURE IN MIND

GREENLEE BROS. & CO.

1746 MASON AVENUE
ROCKFORD, ILLINOIS

Joe: these people frame a lot of machines in Detroit Look them over and let me have your reaction – Sam



If you have a carburetor problem for any type of engine, no matter what size, horsepower or design . . . we either have built, or have the skills to build a reliable carburetor which will meet exactly all your specialized requirements at an economical cost. Your best assurances of outstanding performance are our important and diversified contributions in every phase of carburetor research and development. **Zenith* actually has more experience in more fields with more engine types than any other carburetor manufacturer.**

*REG. U.S. PAT. OFF.

Zenith Carburetor Division

696 HART AVE., DETROIT 14, MICH.

Export Sales: Bendix International, 205 E. 42nd St., New York 17, N. Y.

Bendix
AVIATION CORPORATION

Circle 111 on Inquiry Card for more data



RIVETT SQUAREMASTER "100" CYLINDERS

Unfailing POWER for MILLIONS of cycles!

Here's sure power for unfailing cylinder operation. SQUAREMASTER 100's are the world's finest constructed cylinders—perform with 100% efficiency! 200 P.S.I. air to 500 P.S.I. oil. Available in 7 mountings with standard dimensions, in 10 bore diameters, internal and external threading. Special models and cover combinations. Priced competitively; prompt delivery; meet all J.I.C. requirements.

RIVETT, INCORPORATED

Dept. AI-1, Brighton 35, Boston, Mass.

*Initial High Coefficient of Static Friction

POWER-PACKED FEATURES PROTECTED BY POWER-GUARD CONSTRUCTION

1. Piston rod. Ground and polished alloy steel. Hard chrome-plated. **2.** Piston rod bearing. Replaceable cartridge-type. **3.** Piston packing adjusts automatically. V-block packing minimizes friction. **4.** Correctly stressed tie rods. **5.** Cushion bushings. Bronze, floating type. **6.** Ports rotated to any 90° position. **7.** Steel covers. Take minimum mounting space.



Send for catalog. Proof of SQUAREMASTER efficiency stated in these 20 pages. Write today.

RIVETT furnishes a complete power package

AIR AND HYDRAULIC—VALVES, CYLINDERS, POWER UNITS

Member — National Fluid Power Association

HOW THE ENGINEERING SERVICES OF

Central Foundry

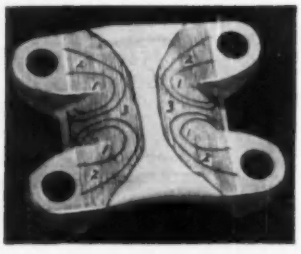
help you design better castings at lower cost

Many new developments here at Central Foundry have broadened the field of application for castings and have given design engineers greater latitude. To assist you in exploiting these new methods and materials to fullest advantage, each of our engineering departments—design, experimental, process and metallurgy—is at your disposal. Central Foundry is also using a number of testing techniques such as stress analysis, cobalt radiography and sonic testing, that have proven invaluable in lowering the cost and improving the quality of castings. These procedures help us to determine the best design and method of producing a casting, either by the green sand method or the shell mold process, and the best material for the casting, either grey iron, malleable iron or ArmaSteel.

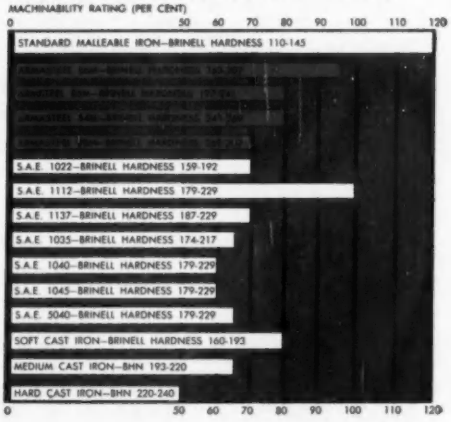
Central Foundry has the capacity to deliver, on schedule, quality castings in production quantities.

STRESS ANALYSIS FOR IMPROVED DESIGN

An important part of our engineering services is the stress analysis laboratory. Stress analysis discovers the amount of stress on a part due to its service function and is an important aid in determining and improving the strength of a part. Improved casting design can be accomplished through the use of stress-analysis by more effectively distributing the metal in the part. The U-bolt anchor plate shown here is a case in point. Our customer was experiencing failures in this part and asked us to see what we could do to solve the problem. Using stress analysis the part was completely redesigned for maximum efficiency. The redesigned part is 35% stronger, 42% lighter and less costly.



EXCELLENT MACHINABILITY FOR INCREASED PRODUCTION



CENTRAL FOUNDRY DIVISION

REDESIGN FOR STRENGTH

This is a rear spring clip pad that was converted to a casting with the help of stress analysis. The clip pad supports the shock absorber arm and clamps the spring to the rear axle of an automobile. When produced as a stamping, this part weighed 4-1/4 pounds. However, when designed as an ArmaSteel casting, weight was reduced to 2-9/10 pounds. Most important, based on comparative stress analysis tests, the casting is *30% stronger* than the stamping. (In addition, the holes are produced by the foundry, making it unnecessary for the customer to punch them.) This conversion from a stamping to a casting resulted not only in increased strength, but in substantial cost savings, as well.



REDESIGN FOR IMPROVED PRODUCT AND ECONOMY

Many of our customers have found that redesigning a product to be made as an ArmaSteel casting rather than as a fabrication, forging or stamping, has resulted in a better part at less cost. The fabricated design of a rear wheel truck hub at the left consists of a forged base with a steel plate welded in place to form the smaller flange. The casting on the right, designed jointly by the customer and our engineers, is of single piece construction, is lighter, stronger and less costly than the fabricated design and eliminates the fitting and welding of the small flange.



FABRICATED DESIGN ARMASTEEL CASTING

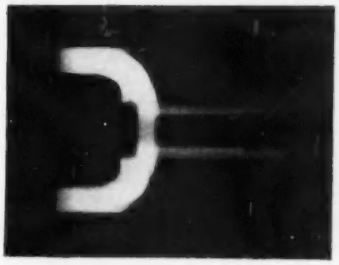
PROCESS ENGINEERING FOR LOWER COST

Our process engineers are continually looking for ways to more economically produce castings, thus lowering the finished-product cost. Shown here is a single casting that combines 5 bearing caps used on a V-8 engine. The casting is almost completely machined as a single piece, and the parts are then separated in a final operation. Substantial savings are realized in both casting and machining costs.



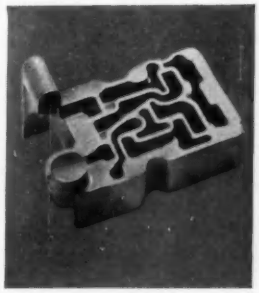
COBALT RADIOGRAPHY FOR ASSURED QUALITY

Radiography, by means of Cobalt 60, has drastically reduced the time required to check castings and is an important aid in obtaining the best possible casting quality. In an effort to eliminate a machining operation on the universal joint yoke shown here, a design change was made in the tube section of the part. When sample castings of the new design were checked radiographically, it was immediately apparent that the design was unsatisfactory since it caused acute metal feeding problems. By redesigning and further checking by radiography, Central Foundry was able to produce, in the shortest possible time, a lighter casting which required less machining in our customer's plant.



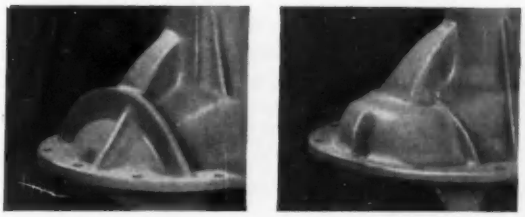
SHELL MOLDING FOR GREATER ACCURACY

Shell molding, a relatively new process of making castings, is now being employed extensively for fast, simple production of complicated castings, such as those requiring narrow, accurate passages and cross sections. It is practically impossible to produce certain parts in any other way without prohibitive costs; this is especially true of ferrous metals. Complicated parts like the manual control valve body shown here, a part of the automatic transmission of a military vehicle, are readily cast in grey iron when the shell process is utilized. The part had been considered as an aluminum die casting, but was thought unsatisfactory because of adverse expansion and wear characteristics. In this case, meeting the requirements for very close tolerances on the thickness and location of ports was made possible by the shell molding process.



REDESIGN FOR WEIGHT REDUCTION

Vehicle weight reduction is a matter of increasing importance to design engineers . . . and more and more existing parts are being converted from a low or medium to a high strength ferrous material such as ArmaSteel. On the left is a grey iron differential carrier currently used in an automobile. By taking advantage of the superior physical properties of ArmaSteel, it was possible to design the part on the right which is *five pounds lighter*. The modulus of elasticity of ArmaSteel is approximately 60% greater (the tensile strength about twice as great) than the grey iron material.



90

GENERAL MOTORS CORPORATION • SAGINAW, MICHIGAN • DEPT. 24



KEEPS CUTTING FLUIDS
AS FRESH AS A DAISY

Here's why ELCIDE 75™ can increase the useful life of your soluble oil emulsions

Elcide 75 controls harmful bacteria that enter standard duty soluble oil emulsions and cause rancid odor, acidic corrosion, and emulsion breakdown. Prior to the development of Elcide 75, certain bacteria developed immunity to commonly used germicides, and no single inhibitor could control their damage.

Elcide 75 is a combination of proven anti-bacterial agents, and includes a powerful new compound related to one of the safest and most effective bacterial inhibitors used in the exacting field of medical surgery today. Just one ounce treats 4 gallons of emulsion.

Elcide 75 is not a "built-in additive" that is weakened by larger emulsion ratios. With Elcide 75 you know you have an effective, safe treatment because you add it to the emulsion right in your own plant.

Elcide 75 is completely safe for employees, machinery, and products. Not only is it non-toxic and harmless to sensitive skin, but its anti-bacterial action reduces the chance for infection caused by contaminated emulsions.



Bacteria cause emulsion trouble. This is a photomicrograph of *Pseudomonads*, one of the harmful types of bacteria found in oil-water emulsions. They enter the emulsion through the air, water, and plant debris, and make it possible for sulfate-reducing bacteria to cause odor, corrosion, and emulsion breakdown. Elcide 75 controls a much wider range of these and other types of damaging bacteria.

WHAT ELCIDE 75 MEANS TO THE METALWORKING INDUSTRY...

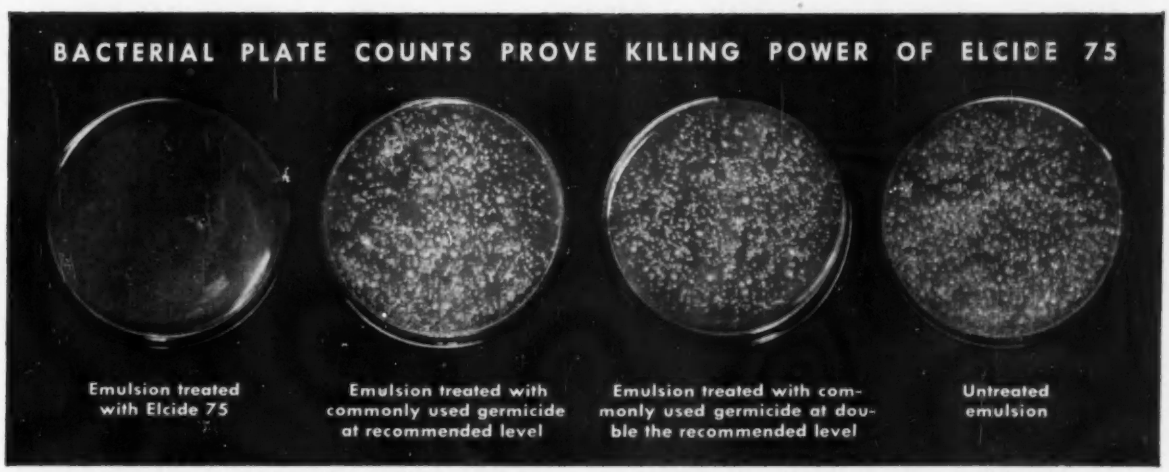
Operating costs can be greatly reduced because of Elcide 75. This saving is an accumulation of several important benefits.

Actual shop tests have shown that one ounce of Elcide 75 added to each four gallons of emulsion can keep the oil-water emulsion fresh as much as 5½ times longer. In one test, emulsions that normally had to be dumped at the end of four weeks ran for 22 weeks when treated with Elcide 75!

You can benefit by three direct savings—costly labor and down time for recharging will be reduced, your soluble oil requirements will drop, and the disposal cost of spoiled emulsions will diminish.

Elcide 75 also contributes to better products and longer machine tool life because it controls the bacteria which often cause acidic corrosion.

You can have a cleaner plant by using Elcide 75. It eliminates objectionable odors as well as bacteria that may cause skin infection. Elcide 75 is nontoxic and safe to use, as proved by tests conducted under normal shop conditions.



The photographs shown above illustrate the broad, powerful anti-bacterial action of Elcide 75. The light areas are bacterial colonies that have grown in three of the emulsion samples during 8 weeks' use. Note that none of these harmful bacteria appear in the emulsion treated with Elcide 75 during the same 8-week period. The emulsion stayed fresh.

PUT ELCIDE 75 TO WORK FOR YOU

The best way to determine the value of Elcide 75 to your own operation is to try it under normal plant conditions, using your standard duty emulsion. After you compare the costs of operation, you will agree that Elcide 75 is a valuable discovery that deserves a permanent place in your plant. Why not try Elcide 75 soon?

ELCIDE 75
Lilly

PRODUCT SPECIFICATIONS
ELCIDE 75

(Lilly's brand of bacterial inhibitor for cutting fluids)

Active Ingredients—Sodium Ethylmercuri Thiosalicylate (Thimerosal) and Sodium *o*-phenylphenate.

Package	Price per Gal.
1-gal. (4 per case) polyethylene	$8.50
5-gallon polyethylene	$8.00
55-gallon stainless steel	$6.50

This product is sold only through selected distributors.

For further information or to place your order, write or phone:

ELI LILLY AND COMPANY, AGRICULTURAL AND INDUSTRIAL PRODUCTS DIVISION, INDIANAPOLIS 6, INDIANA
TELEPHONE: MElrose 6-2211

NEW TUNG-SOL

HEAVY DUTY FLASHER

...built with

twice the life

for trucks, buses, and all other fleet vehicles

The new Tung-Sol heavy duty flasher has a service-rated life of twice that of any other type. It can be used to flash one to six lights without a perceptible change in the flashing rate. It provides for instantaneous four-lamp emergency warning—and it will replace 95% of the flashers now in use. This new flasher will provide more positive action and greater dependability in any service for which the vehicle is presently wired. Made in the universal form, it can be used in either a plug-in or a screw terminal installation. Electroswitch Division, Tung-Sol Electric Inc., Newark 4, N. J.



6 and 12-Volt Types

6-Volt—#535 flashes from one to six 21cp lamps
12-Volt—#534 flashes from one to six 21cp or 32cp lamps

TUNG-SOL® — *First in Flashers*

Circle 115 on Inquiry Card for more data

Circle 116 on Inquiry Card for more data →



Working proof of Superior stainless quality—*the year around*

Superior

STAINLESS STRIP STEEL

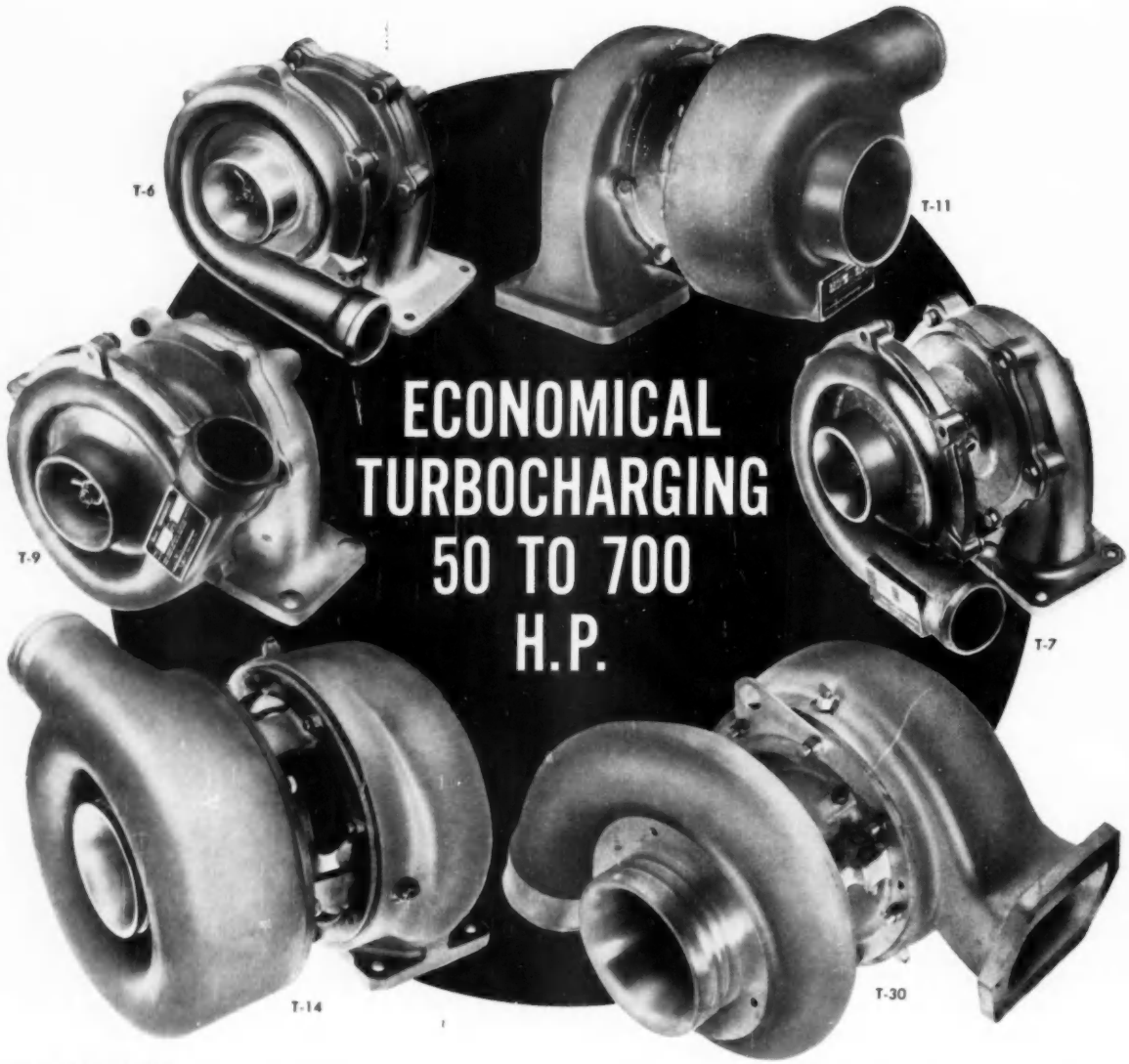
Out front, and ever-bright—looking its best when the weather is worst—Superior Stainless in the millions of windshield wiper assemblies on today's cars speaks for *enduring quality*. The stainless strip is made right to behave right—uniform as can be, from coil to coil. • There's a Superior grade to meet *your* application in every particular. Write.



Superior Steel

DIVISION OF

CARNEGIE, PENNSYLVANIA



ECONOMICAL TURBOCHARGING 50 TO 700 H.P.

AIRESEARCH now offers to the diesel engine manufacturer a complete line of turbochargers for automotive, stationary and marine engines covering the turbocharged range 50 to 700 horsepower for single installations. This family of improved turbochargers maintains excellent performance levels throughout the entire range of power, and allows greater ease of servicing through standardization and simplified design.

The reduced cost, light weight and high output of this turbocharger family enables the diesel industry to gain more horsepower per unit cost than has been possible before. They are especially effective in the low horsepower ranges where they make turbocharging of the smaller diesels economically practical for the first time. In addition, use of the AiResearch turbocharger control systems and intercoolers provides the most effective turbocharging available by accurately controlling turbocharger speed over its complete range regardless of changing load characteristics.

AiResearch has sold more than 20,000 turbochargers, accounting for more than six million horsepower now in operation, and is the largest and most experienced manufacturer of lightweight turbomachinery of all types.

Your inquiries are invited.

THE GARRETT CORPORATION

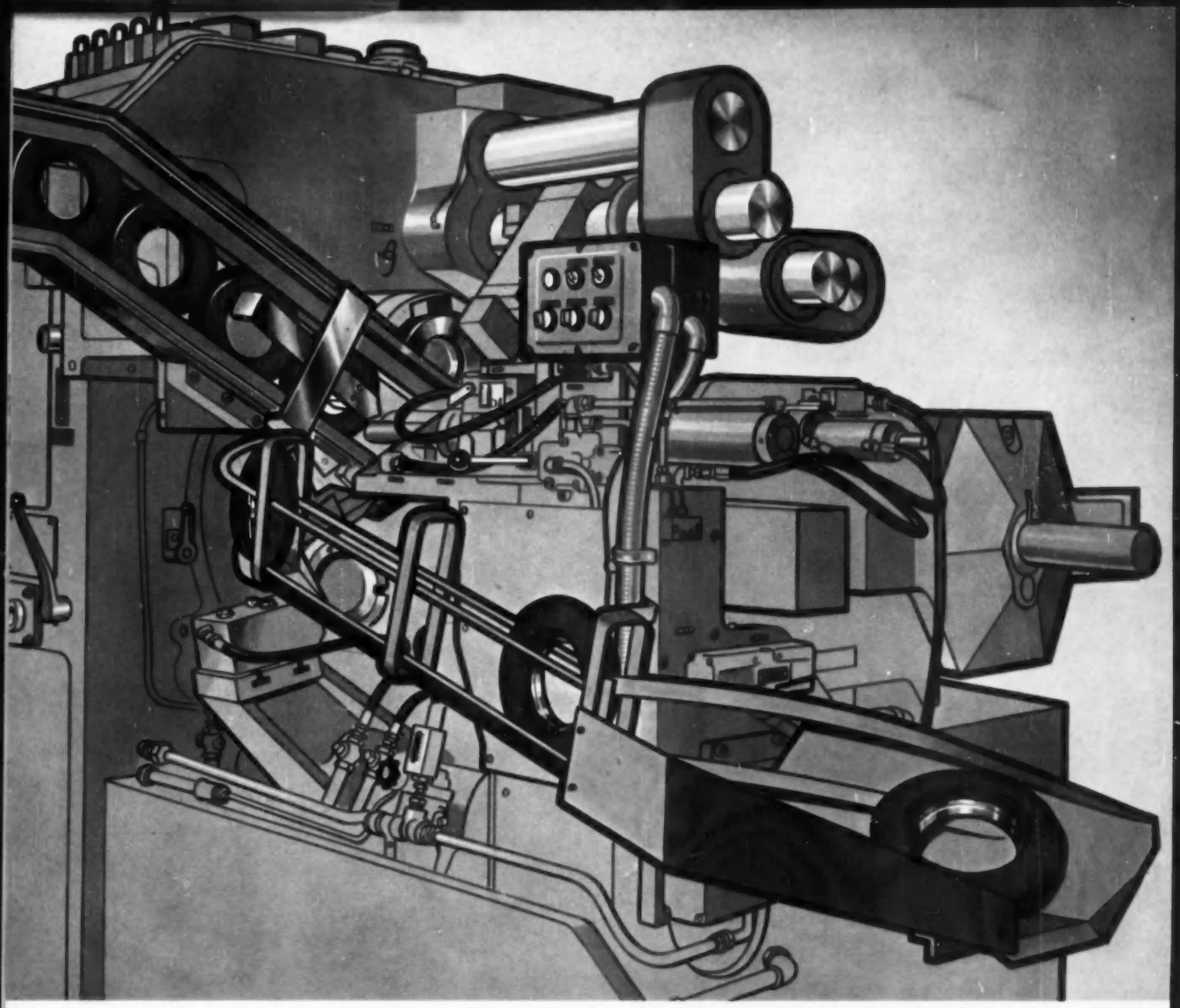
AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

Circle 117 on Inquiry Card for more data

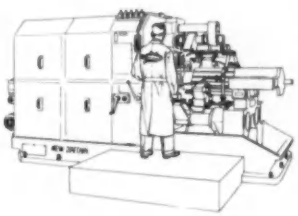
Circle 118 on Inquiry Card for more data



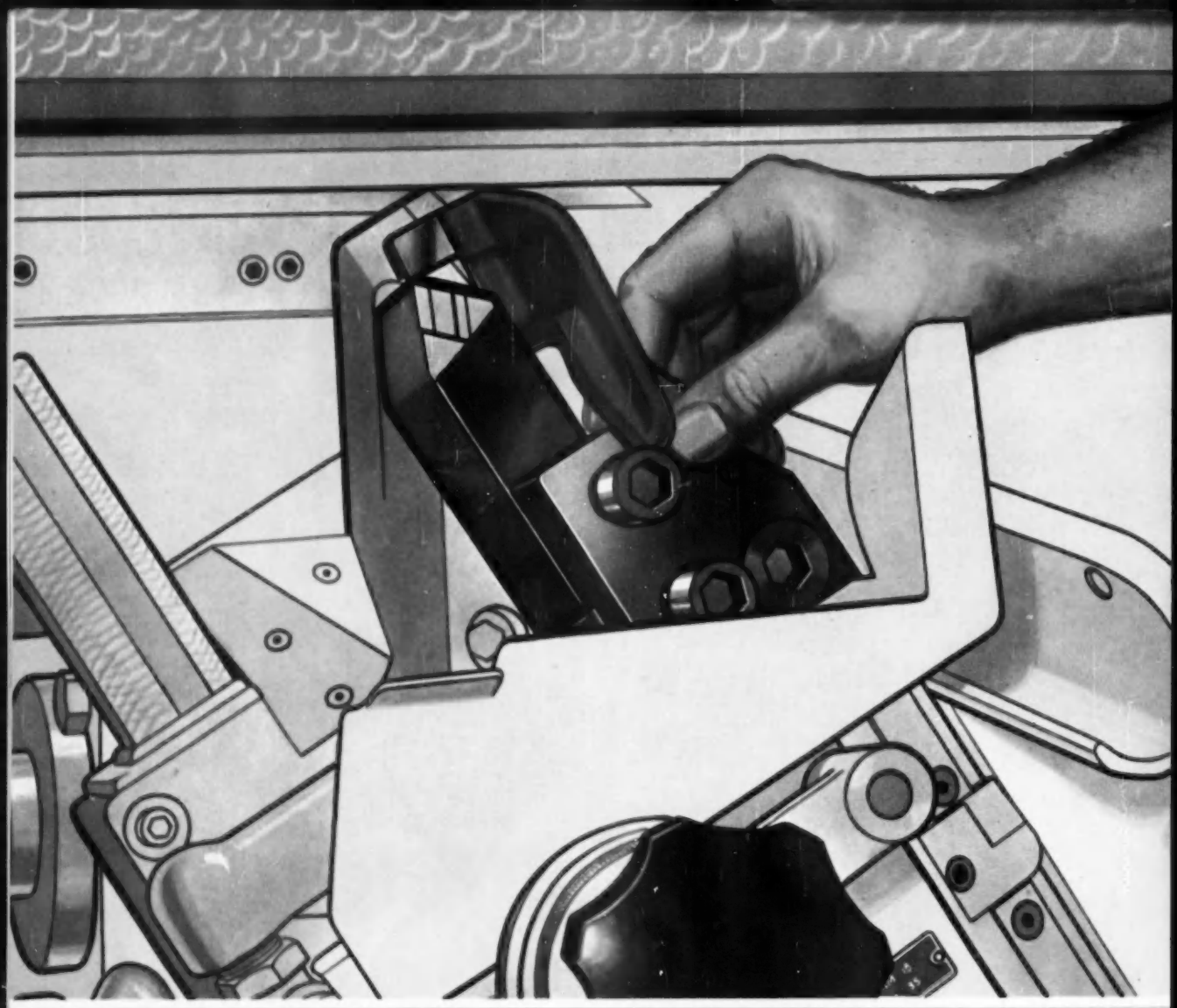
get more chucker work done

with automatic "handling"

New Britain chuckers are the time-tested leaders in their field. Their basic open-end design, an exclusive New Britain feature, makes them unusually well adapted to the automatic handling of pieces. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



Automatic Chucking Machine



1-minute tool change gets more contour work done

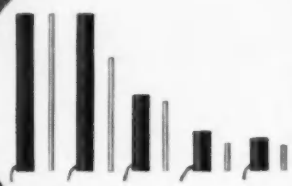
It's a fact — you can do more work in a day with a New Britain +GF+ copying lathe and a single-point tool, than with a conventional lathe using half a dozen. Just slip out the worn tool, slip in a new one, gauge it to a single dimension and you're ready to go again. The template repeats the dimensions. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



New Britain +GF+ Copying Lathe

SANBORN *Transducers*

FOR LINEAR MEASUREMENTS...



DISPLACEMENT

LINEARSYN Differential Transformers

Six series of Sanborn Linearsyns — three of the shielded type, three unshielded — are available, with five models in each series. Linearity is better than 1% of full scale output in all models. Temperature range is from −50° to 205°F.
Special design features include coil assemblies hermetically sealed in epoxy, laminated phenolic jackets (unshielded types) or heavy plated steel jackets (shielded types), improved lead wire strain relief, high permeability alloy cores. Models with axial leads are also available on special order. Within each series all models have identical diameters, tap sizes, lead wires; only the lengths of coil assemblies and cores vary.

Typical Linearsyn Characteristics

Series* (Unshielded)	(Shielded)	Strokes* (±Inches)	Freq. Ranges	Sensitivities* (Volts/inch per volt of excitation at std. carrier freq.)
575DT	585DT	.050 - 1.00	400 cps - 10 kc	.56 - 3.70
576DT	586DT	.050 - 1.00	60 cps - 400 cps	.70 - .90
590DT	595DT	.005 - .100	400 cps - 20 kc	1.60 - 2.60

*Maximum and minimum values available within each series; data on individual models on request.



VELOCITY

LVsyn Velocity Transducers

LVsyn pickups may be used to measure *linear velocity* directly, *displacement* with a simple integrating circuit, or *acceleration* with a differentiating circuit. There are twenty-four models, all self-generating with shielded cylindrical coil assemblies and high coercive force permanent magnets. Twelve models use regular magnet cores; twelve have *non-breakable* magnet cores. Characteristics of the two groups are the same except for output sensitivity, core length and weight. Features include high sensitivity, single-ended or push-pull output, accurate and stable calibration, unlimited resolution, wide range of sensitivities and sizes, temperature range of −50° to 200°F. They can be immersed in hydraulic fluid. No mechanical connection between coil and core permits low friction level. End stops or displacement limits not needed; undamaged if limits are extended.

Typical LVsyn Characteristics

Model	Displacement: Nominal Working Range (inches)	Displacement: Maximum Usable Stroke (inches)	Electrical Characteristics: Voltage Output mv/inch	Electrical Characteristics: Total Impedance Series R ohms	Electrical Characteristics: Total Impedance Connection L henrys
3LVA5*	0.50	1.30	120	2,000	0.085
6LV2*	2.0	3.4	500	19,000	2.4
6LV2-N	2.0	3.4	250	19,000	2.4
7LV9*	9.0	11.0	350	17,000	2.8

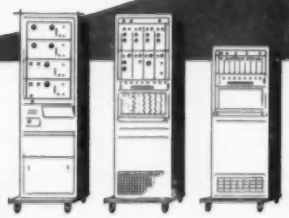
*Four of the twenty-four models available, selected to show minimum, approximate mid-range and maximum working ranges as well as the difference in sensitivity between a regular magnet core model (6LV2) and a non-breakable magnet core model (6LV2-N).

NEW!



COMPLETE DISPLACEMENT TRANSDUCER

"Probe" style, uses differential transformer. With cable and adapter for connection to Sanborn 150, 350 Series Carrier Amplifiers. Stroke ±0.070", high sensitivity, linearity 0.5%, infinite resolution, contact pressure as low as 10 grams. Stainless steel body, carbide tipped contact rod, jeweled bearings. Two models: 580—plug-in cable, flange mounting; 581—miniature, integral cable.



for MULTI-CHANNEL RECORDING

Sanborn direct writing systems now include 1- to 8-channel "150" Series, with a choice of 12 plug-in Preamplifiers; new single-cabinet, compact 6- and 8-channel "350" and "850" Series with interchangeable Preamplifiers, flush-front recorder with electrical pushbutton chart speed control and transistorized Power Amplifiers, and numerous features for high reliability and operating convenience.

For complete facts, call your local Sanborn Industrial Sales-Engineering Representative or write the Industrial Division in Waltham.

(All data subject to change without notice)

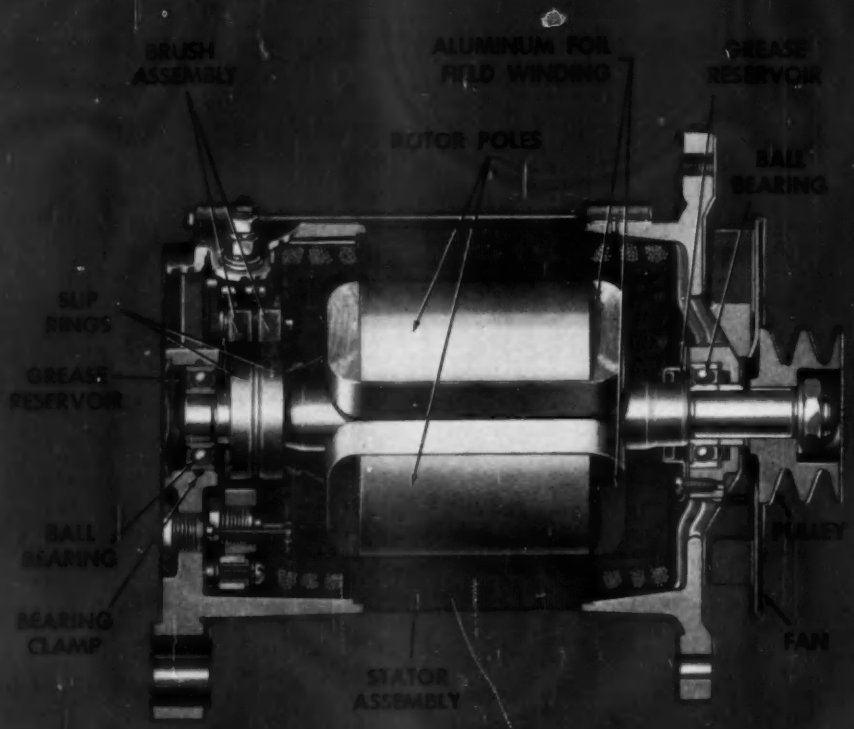
SANBORN COMPANY

Industrial Division
175 Wyman Street, Waltham 54, Mass.

← Circle 119 on Inquiry Card for more data

Circle 120 on Inquiry Card for more data

NOW! REAL CHARGE-AT-IDLE,

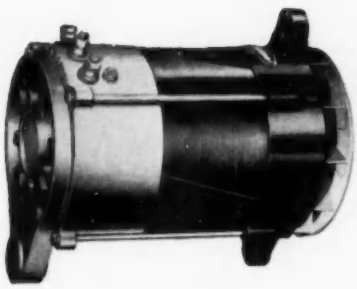


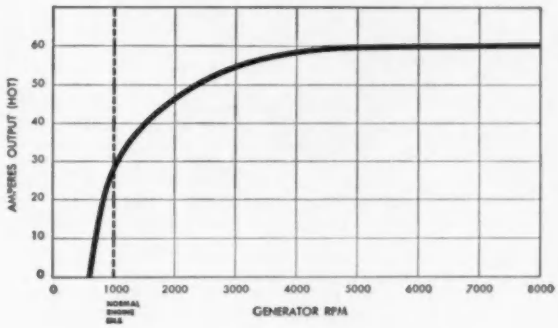


PROGRESSIVE ENGINEERING MAKES THE DIFFERENCE

UP TO TWICE THE TOTAL OUTPUT

WHEN YOU REPLACE STANDARD D.C. EQUIPMENT WITH DELCO-REMY'S NEW SELF-RECTIFYING A.C. GENERATOR





Here's a completely new generator from Delco-Remy *specifically designed* to take care of cars and trucks with extra-heavy electrical loads under all traffic conditions . . . to increase battery life by eliminating deep cycling.

Designed to mount interchangeably with most standard d.c. generators, this compact new unit is only 5¾" in diameter and weighs just 31 pounds. The a.c. design eliminates commutation problems, providing extra-long brush life . . . and the ball bearings are "lifetime" lubricated so that no attention is required between engine overhaul periods. Six specially developed silicon rectifiers built into the end frame eliminate the need for space-consuming external rectifier units, reducing installation time and cost to a minimum.

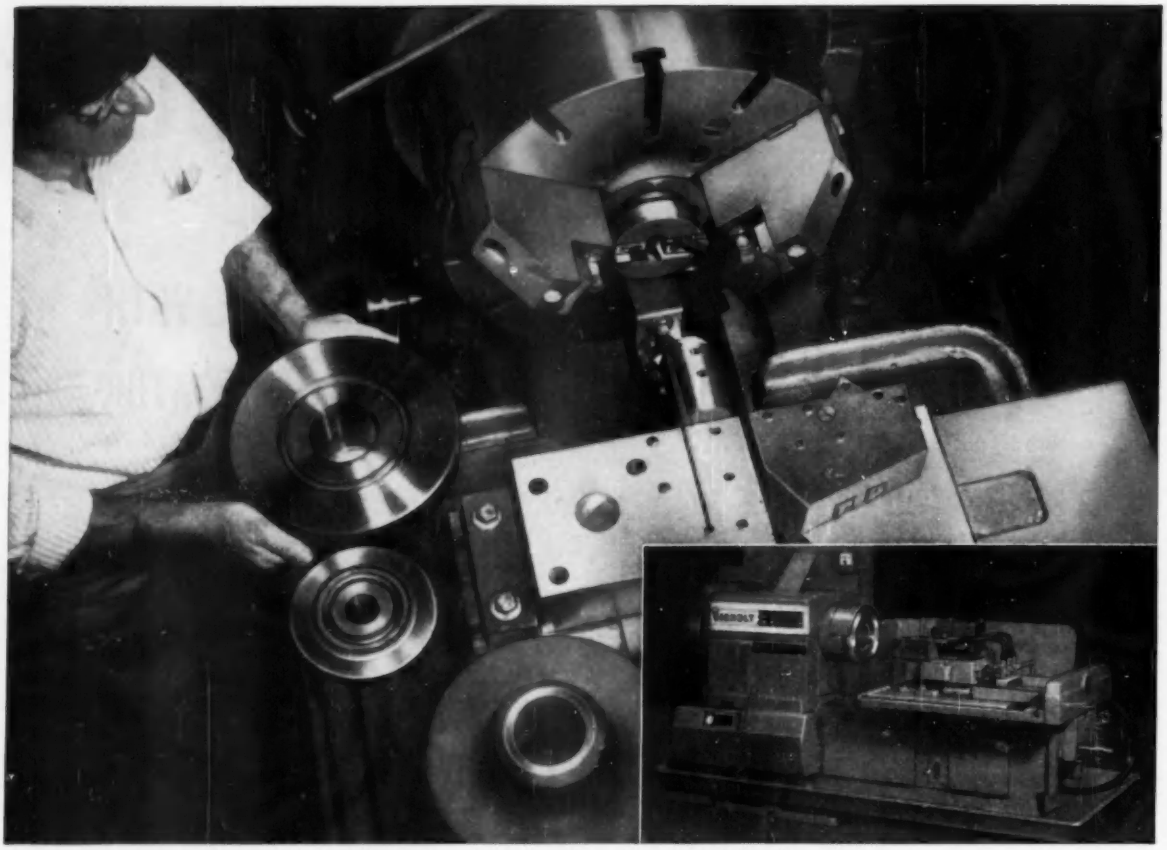
Be sure to specify this new self-rectifying a.c. generator along with its companion transistor regulator (either full or transistorized model) on your new special-duty equipment for 1959. This all-new power team is still another example of Delco-Remy progressive engineering at work for you.

GM GENERAL MOTORS

GENERAL MOTORS LEADS THE WAY—STARTING WITH Delco-Remy ELECTRICAL SYSTEMS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

Circle 121 on Inquiry Card for more data



Smart planning on Simplimatic holds f.t.f. time to 1.7 min. on 6½" diam., 3.3 min. on 10¾" diam. workpieces.

How OTM Corp. cuts costs machining parts in 13 sizes

Handles each part in single chucking, using Simplimatic with back-facing attachments and two-speed motor

You may get ideas from the way OTM Corporation, Houston, Texas, machines steel welding neck flanges and welding necks—with each part in 13 different sizes—completing each part in a single chucking and holding change-over time to an absolute minimum.

Here's how the job is done on a Gisholt Simplimatic Automatic Lathe: Facing, grooving, boring and chamfering operations are performed from tools on short tool slides, with T-slotted tops for quick adjustment. Relieving the boring tool at the end of the cut eliminates tool tracks. Simultaneously, a special back-facing attachment works through the spindle to shave-face and chamfer the O.D. on the hub. A power chuck wrench operates the scroll chuck and permits mounting this attachment in the spindle bore. A two-speed motor provides correct surface speed and permits switching from high speed (for turning and facing) to low speed (for grooving operation) and back again, during the Simplimatic's automatic machining cycle.

Here, again, the Gisholt MASTERLINE Simplimatic Automatic Lathe saves a manufacturer the cost of a special machine. Its extra wide platen table provides ample space for an infinite number of slide and tool arrangements—and its table feed permits tools to engage with the work or perform additional machining operations before actual slide movements begin. Ask your Gisholt Representative to show you how the Simplimatic performs special machine functions at standard machine prices—on your product and under your production conditions.

MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

ASK YOUR GISHOLT REPRESENTATIVE ABOUT GISHOLT FACTORY REBUILT MACHINES WITH NEW MACHINE GUARANTEE

what do you want

from your bearing supplier?



It is interesting to note the reasons given by leading vehicle manufacturers for their use of BCA ball bearings as original equipment.

Product quality, of course, ranks first in importance.

Prompt, as-promised delivery scored very highly.

BCA engineering assistance was rated by many as being of prime importance.

BCA has had over half a century of specialized experience in the design and manufacture of ball bearings for car, truck, bus, tractor and farm implement manufacturers. Many of our customers have credited BCA with having made valuable contributions toward reduction of production costs and improvement of operating efficiency of their vehicles. We may be able to help you.

BCA

BEARINGS COMPANY OF AMERICA

Division of
Federal-Mogul-Bower Bearings, Inc.



Circle 129 on Inquiry Card for more data



MIDLAND AIR COMPRESSORS

COST YOU LESS POWER PER CUBIC FOOT OF AIR

Trying to stretch your horsepower? Then save what you have with an efficient Midland Compressor. On the test stand or on the track, you'll see Midland Air Compressors use less power to produce more air—at any speed. Look at the valves . . . check operating temperatures . . . and you'll see why!

Don't take anyone's word for it! Run a test on a Midland Compressor today. We'll be glad to furnish samples.

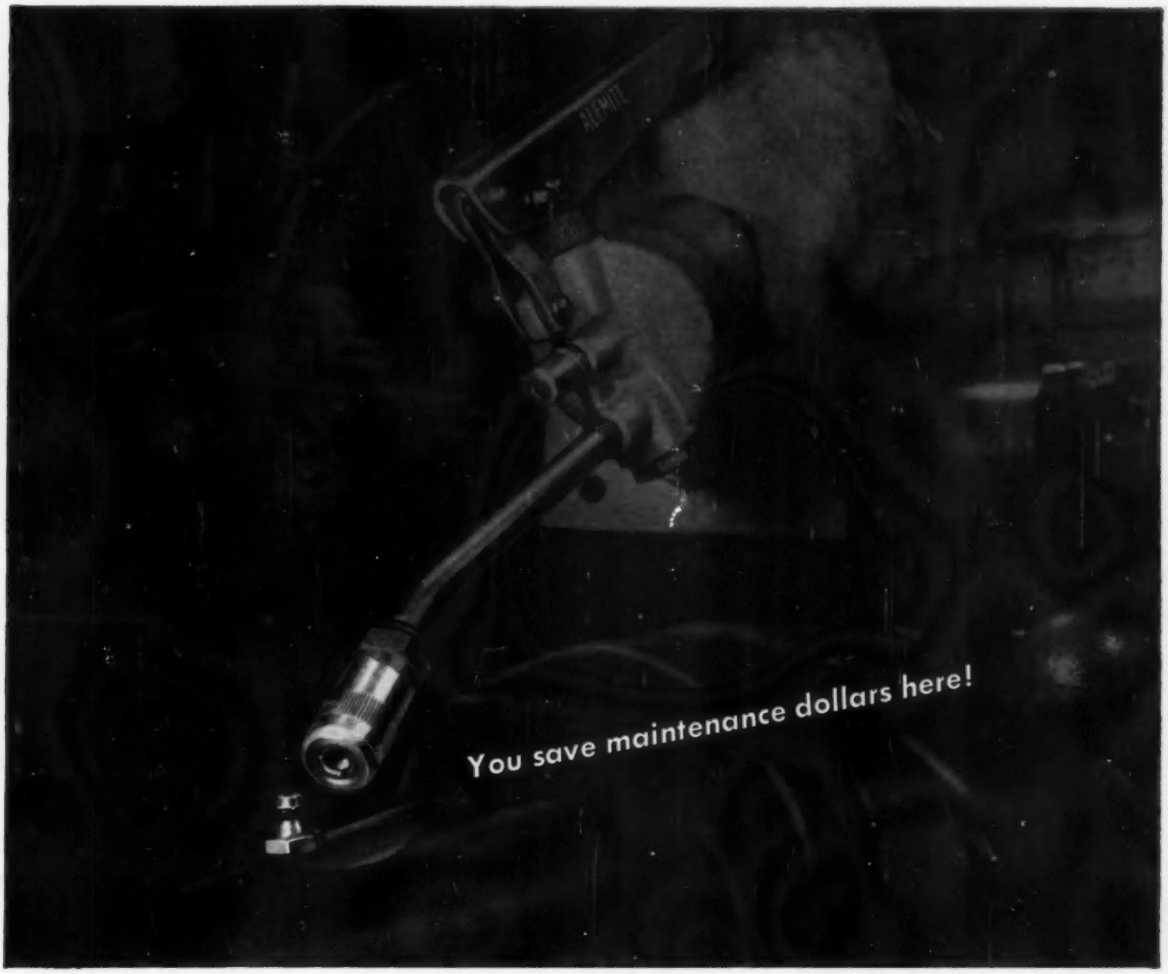
MIDLAND-ROSS CORPORATION

OWOSSO DIVISION,
OWOSSO, MICHIGAN

AIR MIDLAND BRAKES

ONE OF THE 400 LARGEST AMERICAN CORPORATIONS

Circle 124 on Inquiry Card for more data



Alemite Hand Guns and Fittings Give You Up to 10,000 lbs. of Lubrication Power!

The point of lubrication is where maintenance costs can be cut—providing you have the right equipment for the job!

This heavy-duty Alemite hand gun—combined with genuine Alemite lubrication fittings—brings up to 10,000 lbs. of pressure to even ordinary lubrication points. It gives you power to spare for fast, efficient, money-saving protection of every machine in your plant!

Gun handles all regular pressure gun greases. Long operating handle for maximum leverage. Loader fitting permits fast, clean filling (or gun may be filled by suction). Heavy steel linkage for true piston alignment. Capacity, 1 lb. Get more out of man-hours and machine-hours with Alemite lubrication equipment!

Symbol of SW Excellence

ALEMITE
DIVISION
STEWART-WARNER
CORPORATION

1850 Diversey Parkway, Chicago 14, Illinois

—MAIL COUPON FOR COMPLETE INFORMATION—

ALEMITE, Dept. U-19
1850 Diversey Parkway, Chicago 14, Illinois

Please send me free your complete catalog of Alemite industrial lubrication equipment

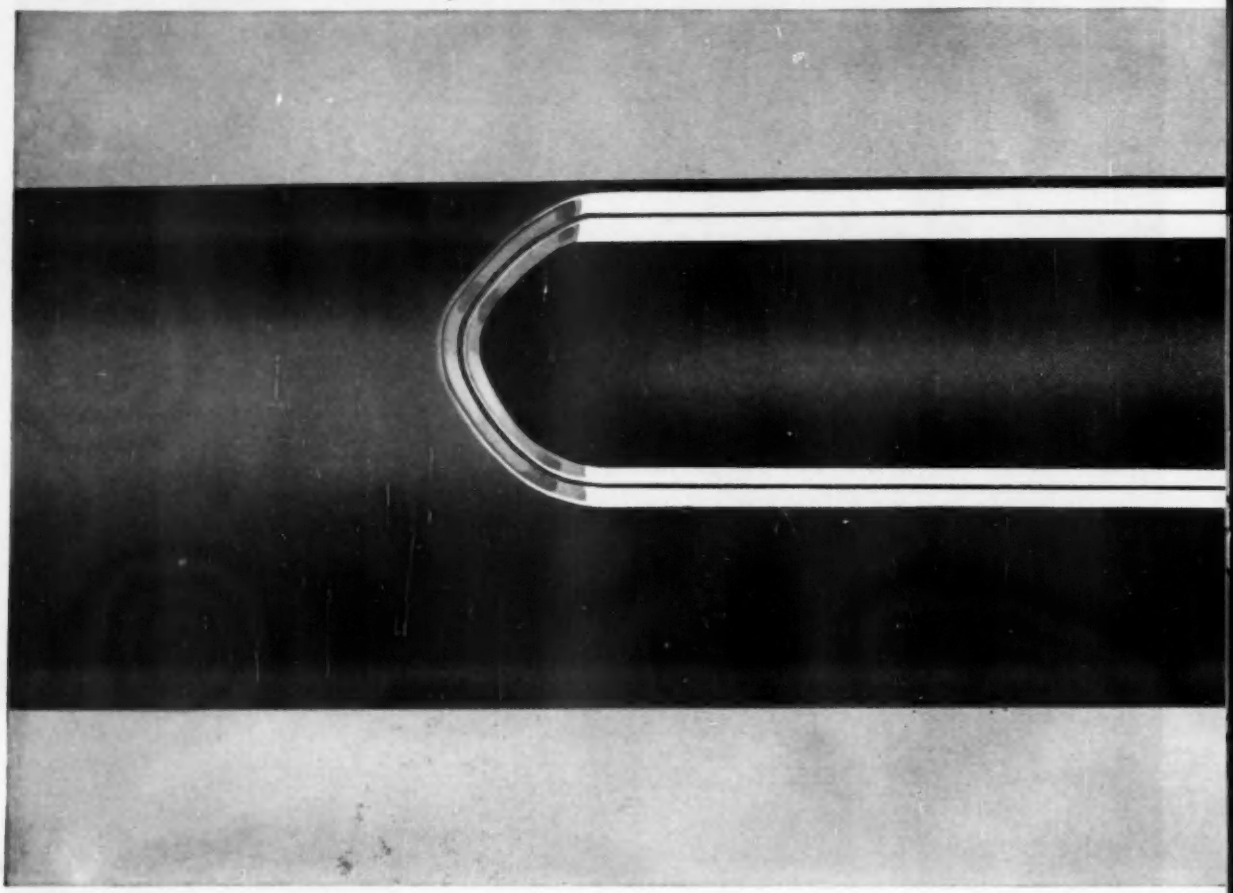
Name.....

Company.....

City.....State.....

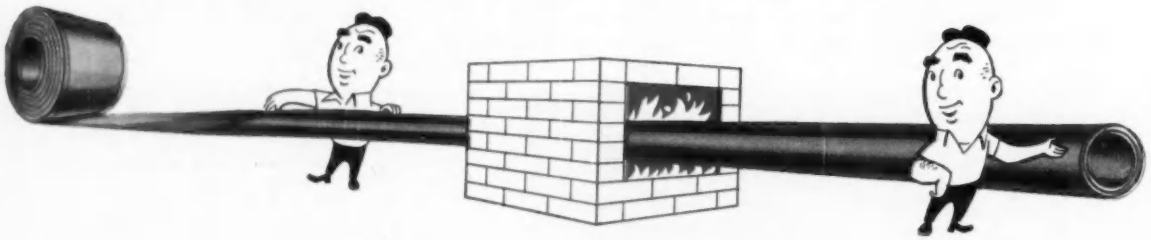
Circle 125 on Inquiry Card for more data

WHY BUNDY LEADS IN MASS-FABRICATION:



DOUBLE FLARE...Another reason why Bundyweld

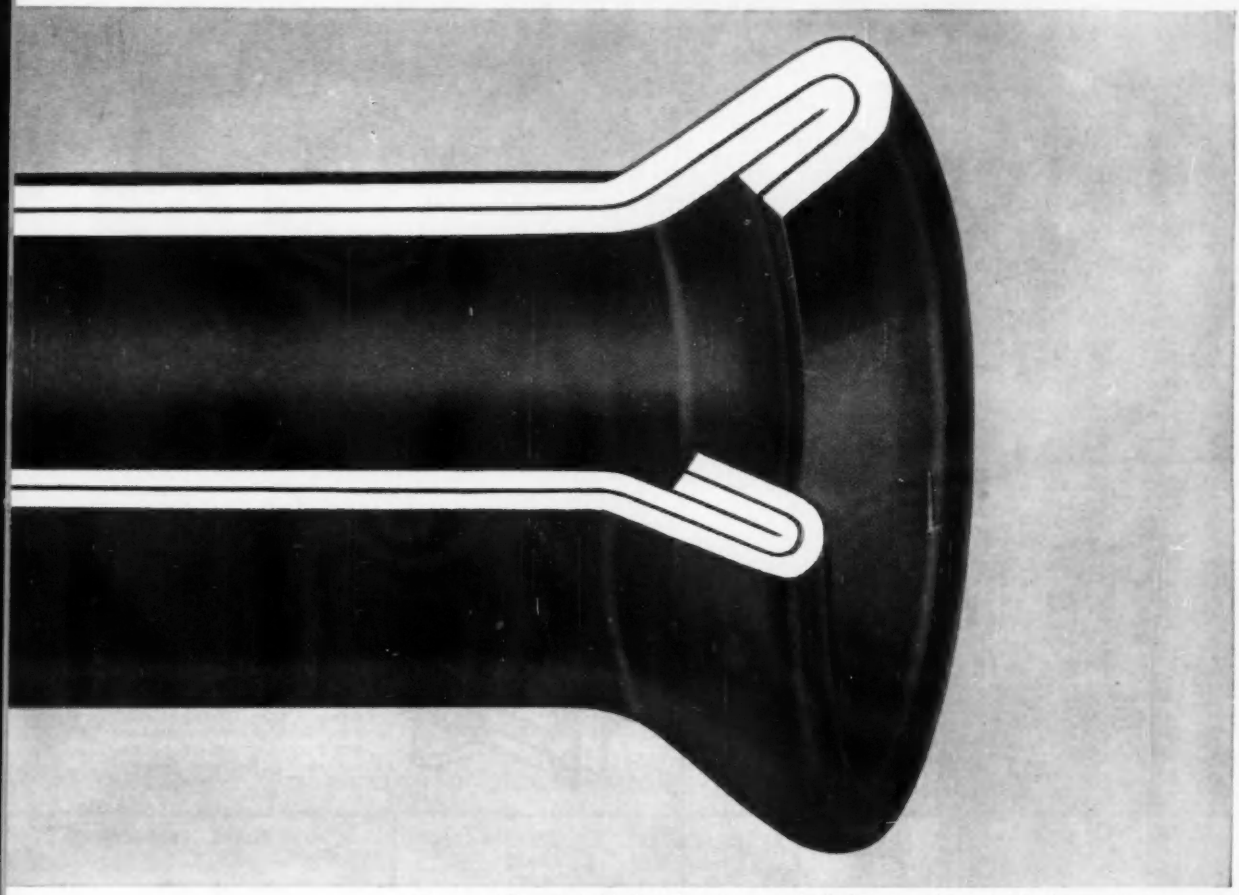
And Bundyweld can be mass-fabricated to any specifications you give—at a low cost made possible by three Bundy advantages:



Bundyweld starts as a single strip of copper-coated steel. Then it's continuously rolled twice around laterally...

into a tube of uniform thickness, and passed through a furnace where copper coating fuses with basic steel.

Result: Bundyweld Tubing—double-walled, beadless, metallurgically bonded through 360° of wall contact.



Cutaway of Bundy double flare (greatly magnified) that puts almost *twice* the metal at the seat.

insures extra brakeline safety

This is the famous Bundy® double-flare—developed to take high wrench-torque and frequent uncouplings . . . and still carry high-pressure hydraulics *with perfect safety*. It's just one example of how Bundy leads in *mass-fabrication* these three ways:

1. The tubing itself—Bundyweld®, double-walled from a single steel strip. It stands up against brutal shocks and vibration fatigue. That's why it's on 95% of today's cars, in an average of 20 uses each.

2. Bundy design service—Skilled engineers are on call at any stage in the development of your product. Often they'll suggest short-cuts to trim costs.

3. Bundy fabrication service—Trained technicians man Bundy-designed machines . . . turn out parts to your specifications at lowest unit cost.

Add it up—then check *first* with Bundy for the finest in small-diameter tubing plus unmatched design and fabrication service. Contact us today!

BUNDY TUBING COMPANY • DETROIT 14, MICHIGAN

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING • AFFILIATED PLANTS IN AUSTRALIA, BRAZIL, ENGLAND, FRANCE, GERMANY, AND ITALY

There's no real substitute for

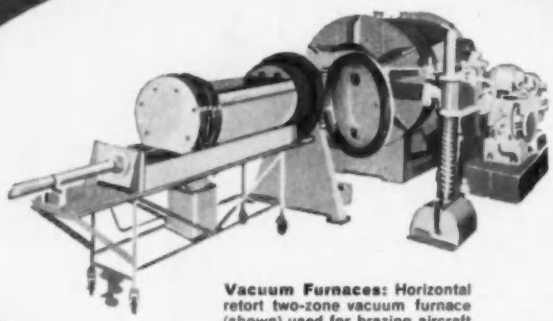
BUNDYWELD® TUBING

Bundyweld and Bundy specialty tubings are sold through distributors in principal cities

Circle 126 on Inquiry Card for more data

Wherever industry needs heat . . .

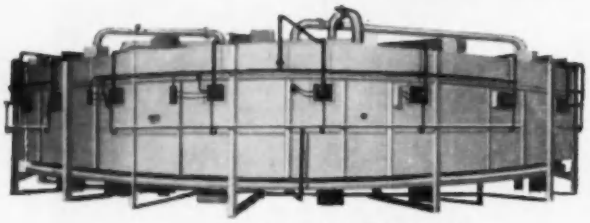
There's LINDBERG equipment just right for the specific job



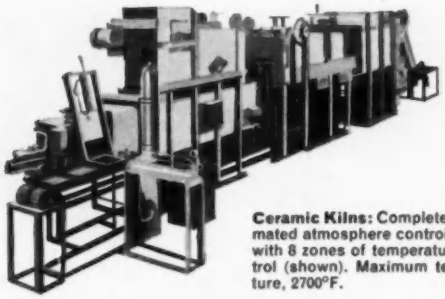
Vacuum Furnaces: Horizontal retort two-zone vacuum furnace (shown) used for brazing aircraft components.



Cyclone Tempering Furnaces: Batch type fuel-fired tempering furnace (shown). Famous in metal treating industry for years.



Rotary Hearth Furnaces: Doughnut type field-installed gas-fired furnace (shown) with capacity of 13,000 lbs. per hour.



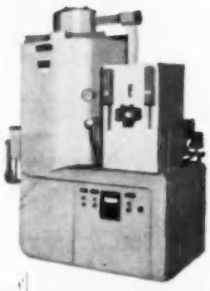
Ceramic Kilns: Completely automated atmosphere controlled kiln with 8 zones of temperature control (shown). Maximum temperature, 2700°F.



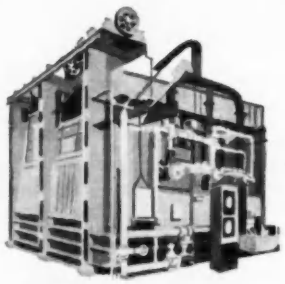
Pilot Plant Equipment: Atmosphere tube unit (shown) for ceramic research and development at temperatures up to 2750° F.



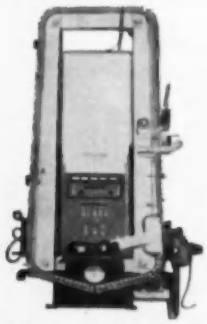
Laboratory Equipment: One-unit box furnace (shown), muffle or for non-oxidizing atmosphere with temperature range to 3000° F.



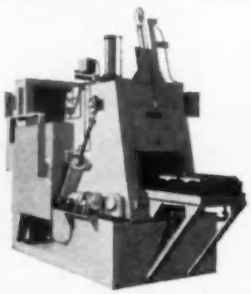
Atmosphere Generators: Hyen generator (shown) for endothermic atmospheres. Generators for all required atmospheres.



Aluminum Reverberatory Furnaces: Twin-chamber melting and holding furnace (shown) with 45,000 lbs. capacity.



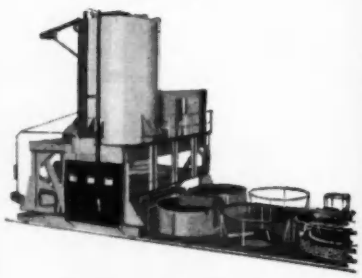
High Frequency Units: Vertically designed, completely automatic "HF" unit (Shown) for aluminizing automotive valves.



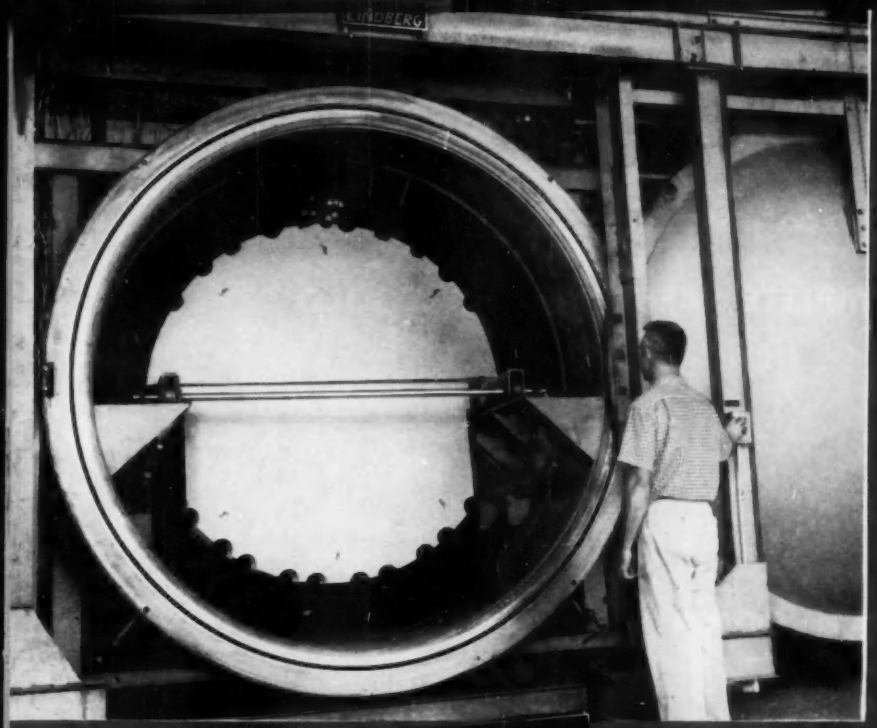
Automatic Carbonitriding Furnaces: Automated integral quench type (shown) with CORRTHERM electric elements.



Melting and Holding Furnaces: Electric resistance furnace (shown) with capacities of 750 lbs. to 1500 lbs.



Gantry Type Furnace: Vertical, controlled-atmosphere, drop bottom, hardening furnace. Complete installation field-installed by Lindberg.

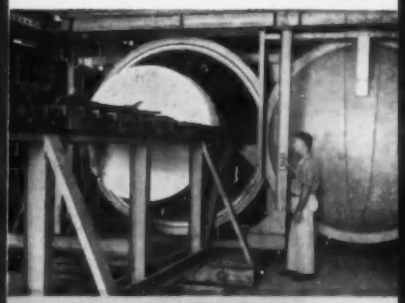


Lindberg-Designed

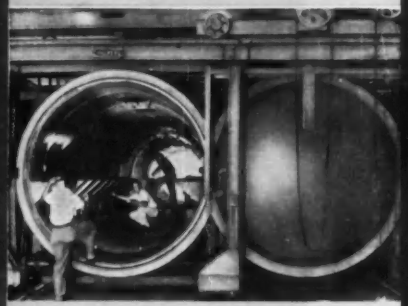
Large Capacity Vacuum Heat Treating Furnace Improves Titanium Quality, Saves Money in Aircraft Manufacture

Here is an outstanding example of Lindberg's ability to apply a basic furnace design to the requirements of a specific job. This vacuum furnace was designed for a leading aircraft manufacturer to heat treat large sheets of titanium. In operation it reduces the hydrogen content of the metal from 500 parts per million to 50 parts per million or less, in a maximum time of 6 hours. And this improvement in quality is achieved with a corresponding reduction in production costs. The furnace has a temperature range up to 2100° F. and operates in a vacuum of less than one millionth of an atmosphere. A unique internal cooling system makes the furnace adaptable for brazing stainless steel honeycombs, a new development in aircraft manufacture.

Lindberg equipment and planning can help you find the answer to any problem of applying heat to industry. We cover the field, heat treating, melting and holding, tempering, brazing, enameling furnaces, ceramic kilns, high frequency units, and are in the ideal position to recommend the equipment most suitable for your needs. This can be factory built or field-installed in your own plant, fuel-fired or electric. Consult your local Lindberg Field Representative (see the classified phone book) or get in touch with us direct. Lindberg Engineering Company, 2491 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.



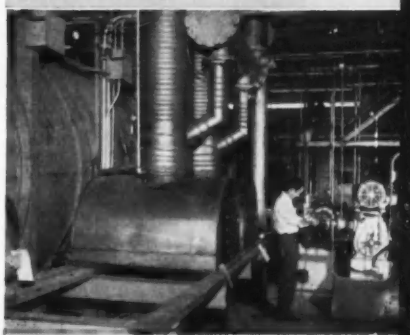
6 feet in diameter, the furnace easily takes large titanium sheets.



Total furnace length is more than 40 feet.



After vacuum cycle, inert gas is introduced into chamber to assist cooling.



Specially designed pump maintains vacuum of less than one-millionth of an atmosphere.



LINDBERG heat for industry

Circle 127 on Inquiry Card for more data

NEW FROM HONEYWELL!

THE "COMPLETE SAFETY" PROTECTOGLO*

FIRST AND ONLY

COMPLETELY FAIL-SAFE

FLAME SAFEGUARD

Listed and approved by the Associated Factory Mutual Laboratories and by Underwriters' Laboratories.

The need for protection in gas burner operation has been long recognized . . . and the subject of intensive research.

In 1951, a Honeywell advancement provided a "self-checking" operation at the time of burner startup . . . and spurred the search for full-time protection, because flame-safeguard components can and do fail "unsafely."

Now Honeywell, first again, offers a self-checking circuit that *continuously* supervises all system components. Never before has there been such complete protection . . . *protection you can't afford to be without.* Write for Specification S1015-5.

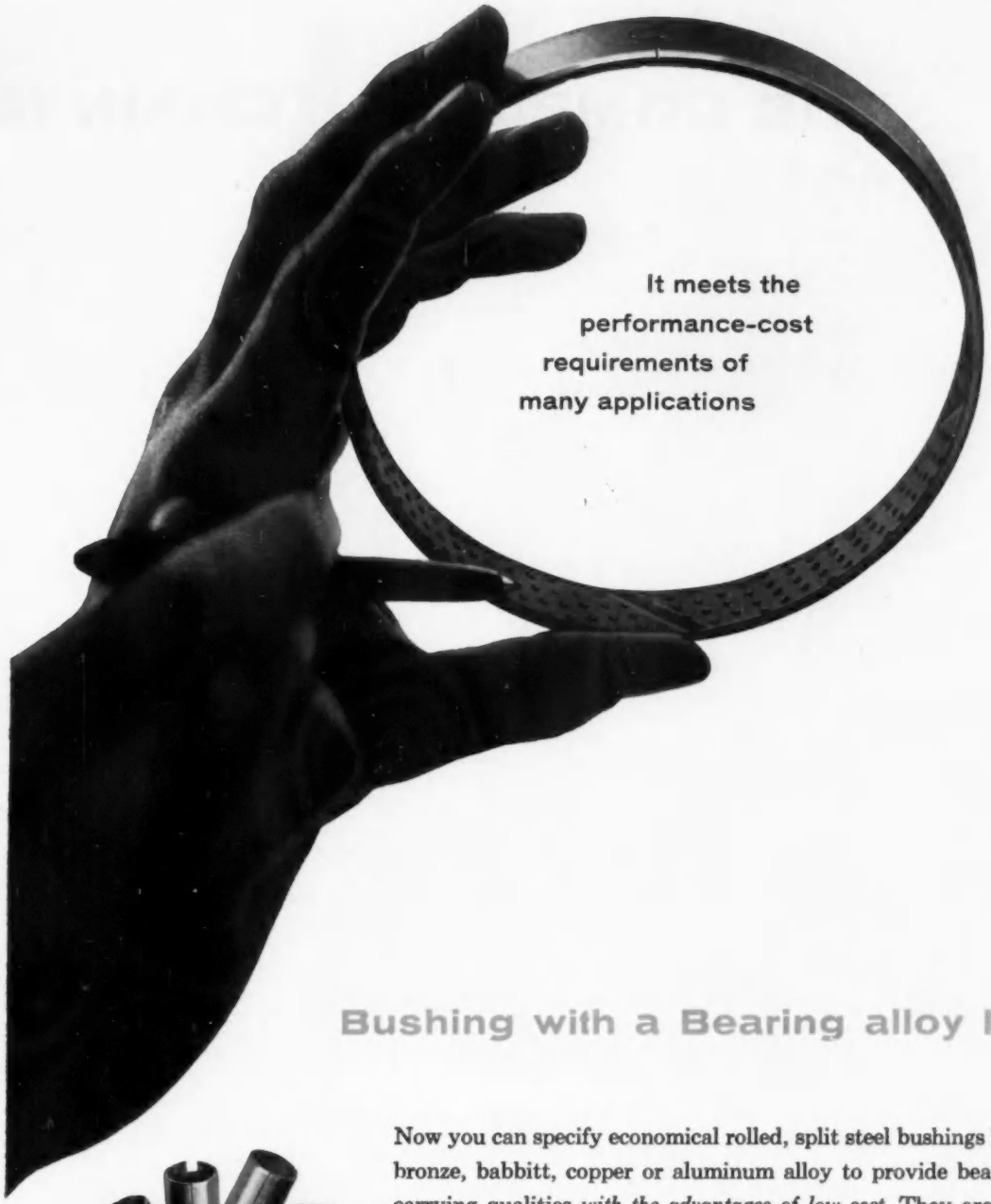
MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

First in Control

"'A significant technical advancement" . . . at the A.G.A. Convention, Parade of Gas Progress.

Circle 123 on Inquiry Card for more data



Bushing with a Bearing alloy lining



Now you can specify economical rolled, split steel bushings lined with bronze, babbitt, copper or aluminum alloy to provide bearing load-carrying qualities *with the advantages of low cost.* They are available in many lengths and diameters, with straight, clinch, butt or special seams. They can be ball indented and have oil holes, grooves, notches, slots, as required. Quality controlled manufacturing to meet your specifications. We provide complete engineering service. A copy of the "Formed Bushing Design Guide" will be sent on request.

FEDERAL-MOGUL DIVISION

FEDERAL-MOGUL-BOWER BEARINGS, INC., 11037 SHOEMAKER, DETROIT 13, MICHIGAN

Circle 122 on Inquiry Card for more data

THE COMPLETE CHAIN IS



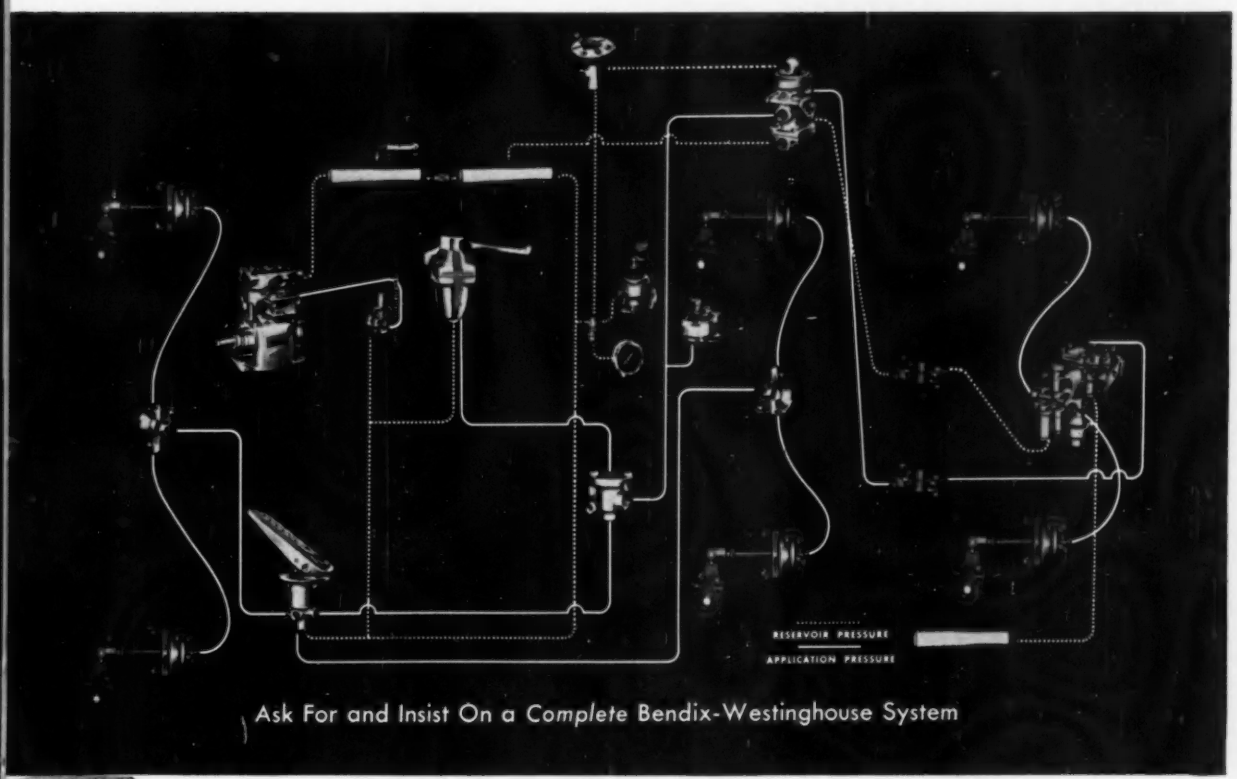
WHAT COUNTS!

Yes . . . the *complete* chain . . . made of safety-forged, matched links . . . with the built-in dependability and performance that only an experienced chain maker can deliver. It's the same with air brakes. You *could* buy a link here and a link there. But you get by far the most efficient, most reliable performance when you specify a *complete* Bendix-Westinghouse Air Brake System. It, too, is engineered as a complete "chain" in which every part and every component is *system-engineered* to do its specific job with peak efficiency. And for that reason you not only get top performance with Bendix-Westinghouse—but get it over a longer period of time and at less cost than is possible any other way.

Best proof of this is that more trucks and buses are equipped with Bendix-Westinghouse Air Brakes than with all other makes combined. These thousands of truck and bus operators who make up the Bendix-Westinghouse "family" long ago proved an important fact to their own satisfaction—that it pays to let us assume full systems-engineering responsibility for air brake performance, dependability, and long, economical service life.



Another exclusive advantage you get with Bendix-Westinghouse is our Repair Exchange Service—most outstanding in the entire industry. It permits exchange of any worn unit for a factory-reconditioned replacement unit, rebuilt to the latest design, at nominal cost and with new-equipment warranty.



Ask For and Insist On a *Complete* Bendix-Westinghouse System

Bendix-Westinghouse

AUTOMOTIVE AIR BRAKE COMPANY

General offices and factory—Elyria, Ohio. Branches—Berkeley, Calif. and Oklahoma City, Okla.

Circle 130 on Inquiry Card for more data



. . . Steel users may find tighter inventory controls the best hedge

"Let the other fellow carry the inventory" is a well-tried business principle that is taking on added significance for many manufacturers today.

As featured in a recent issue of PURCHASING WEEK, the cost of borrowing money is going up. Over the next six months, inventory growth financing will get tougher. Even now, the publication pointed out, there's a growing reluctance by bankers to make long-term, capital-goods type loans. The newspaper concluded that interest rates, too, are heading rapidly toward the high levels reached during 1957's tight-money period.

Faced with these new complications, steel buyers may well find continuance of recession-born, modified inventory policies the best hedge against tight money and higher interest.

For example, during the recent slump many companies proved to themselves that the varied facilities of steel service centers cut costs all along the line. They avoided long-term commitments and substantially reduced their need to borrow money. They released precious working capital for more productive purposes . . . freed valuable storage space . . . reduced handling costs and cut scrap loss, interest, insurance, taxes, etc.

This kind of cost-conscious buying is especially sound when you consider the unusually broad scope of Ryerson stocks, and the speed and dependability of Ryerson services. Buying cut-to-size steel—any kind, shape, size and quantity—gives you complete flexibility to meet quick shifts in production schedules. And you have the added assurance of getting uniform, high-quality steel—unequaled Ryerson *certified* quality.

Your Ryerson representative is well qualified to review the facts and help you get the maximum value for your steel-buying dollars. Call him any time to analyze your requirements with you.

RYERSON CERTIFIED QUALITY

RYERSON STEEL®

Member of the INLAND Steel Family

Principal Products: Carbon, alloy and stainless steel—bars, structurals, plates, sheets, tubing—aluminum, industrial plastics, metalworking machinery, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI • CLEVELAND DETROIT • PITTSBURGH • BUFFALO • INDIANAPOLIS • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Circle 131 on Inquiry Card for more data

News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 120, No. 2 **January 15, 1959**

Aluminum Engine Readied For Chrysler's Small Car

Chrysler Corp. has an aluminum engine in the works for its forthcoming smaller passenger car. Some production equipment already has been ordered for pilot runs.

The Chrysler unit, a front-mounted in-line six, will have a displacement of around 170 cu in. But Plymouth Div. might remachine the block later on for a bigger displacement (225 cu in., perhaps) and adopt the larger engine as its standard six-cylinder offering for 1961.

Plymouth is known to be planning a new six for 1961, and in this way the corporation might be able to kill two birds with one aluminum engine block.

The small car engine—if it goes through—will be die cast in Kokomo and completed at the Trenton engine plant. Die casting equipment already has been ordered for Kokomo installation for test pourings.

GM's flat aluminum engine will be built in Tonawanda, N. Y., with the engine block cast in nearby Massena. GM, incidentally, is moving production equipment into the former Chevrolet Willow Run truck plant, where its small car will be assembled.

That leaves Ford as the only Big Three entry with a cast iron engine for its small car. Ford is tooling its Lima engine plant for production of an in-line six.

Ford is determined to get its small car out as quickly as possible after the GM vehicle is unveiled. Consequently, the first-year Ford product may not be quite what the company would like, and the cast iron engine might be an economical expedient slated for replacement in 1961 by an aluminum powerplant.

Ford is not going overboard on this stop-gag engine. The program involves reworking of machine tools to a large degree, rather than purchase of too much new equipment.



New hardtop added to Bel Air series

Ford should not be counted out of the aluminum engine picture. The company is planning a V-8 for "early 1962" introduction. This unit will have cast iron sleeves but might employ aluminum in other areas besides the block, such as the intake manifold. The pilot die for casting is on order.

British Engine Firm to Get Oliver Outboard Motor Line

Oliver Corp. will trade its outboard motor line to F. Perkins Ltd. of Peterborough, England, at the completion of 1959 model production. Perkins will begin building the engines sometime next fall.

According to the agreement, Oliver will turn over design and manufacturing rights and certain tooling in exchange for an undisclosed amount of Perkins stock. Oliver will continue to distribute the engines.

Oliver took over the outboard line in 1955 from Chris-Craft Corp. The line includes 6, 16, and 35 hp models.

Many of the 270 persons currently employed at the outboard plant in Battle Creek, Mich., will be absorbed by the firm's local farm implement plant.

New Bel Air Sport Sedan Joins Chevrolet Lineup

A new four-door hardtop sport sedan in the Bel Air series has been added to Chevrolet's lineup for 1959. The car, announced in mid-January, broadens the Bel Air series to three models.

The new model is 2 in. lower than the other Bel Air models. Previously, only the higher-priced Impala series offered sport sedan styling.

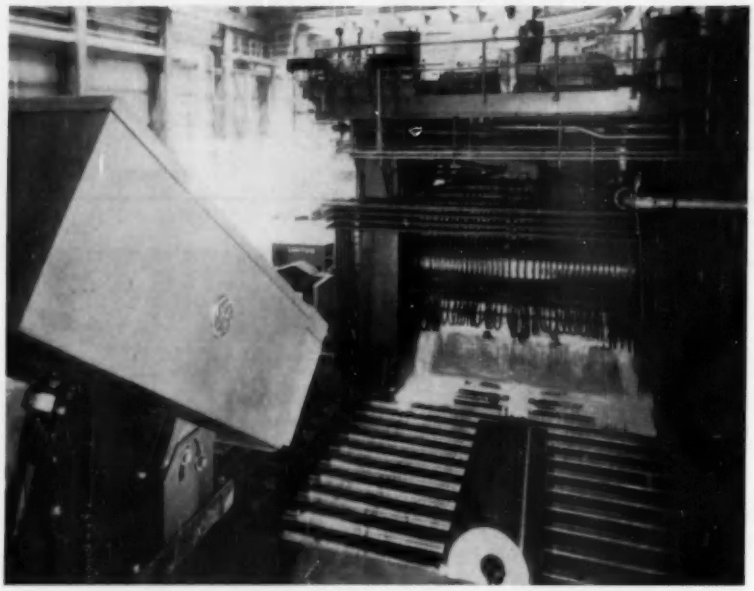
Dodge Truck Says Demand For Sixes Tops 58 Percent

Dodge Truck says demand for its six-cylinder models during 1958 hit 58.7 per cent, up from 48.1 per cent a year ago.

Division general manager M. C. Patterson says the increase reflects a desire for economy on the part of truck operators.

The six, according to Patterson, is more economical than the V-8 for short hauls and multistop delivery. He says 1958 sales showed large increases in fleet, government and railway delivery orders.

NEWS AUTOMOTIVE AND AVIATION



TV "EYES" ROLLING PROCESS AT KAISER PLANT

Operators at Kaiser Aluminum's huge Ravenswood Works control the rolling process with the aid of two General Electric closed circuit television systems. Aluminum slab heated up to 1175 F and weighing about 12,000 lb has just passed through a 168-in. reversing mill. Because operator can see only the near side of mill, he relies on TV eyes to view the metal as it is rolled on the far side. Installation is part of $14 million electrical system engineered by General Electric.

Final 1958 Production: 4,242,276 Passenger Cars

Final production figures for 1958 show total U. S. passenger car output of 4,242,276 units, a drop of 30.7 per cent from the 1957 total of 6,115,461 cars.

By this time the reason is well known. The general business slump was particularly hard on the automobile industry. Also, strikes cut heavily into production at General Motors and Chrysler Corp., and to a lesser degree at the other three producers.

But December production rates and a pick-up in daily sales at the end of the year point to a better year ahead. Industry executives and economists sound more optimistic now than they did last fall when the 1959 models were introduced.

AMC president George Romney recently predicted total sales of passenger cars should top 6 million units in 1959, including imports. This figure, he added, also would include 1 million "small and compact" cars.

Chrysler president L. L. Colbert, in a year-end statement, also cited the 6 million figure, including 400,000 foreign car sales. A third industry spokesman, Ford economist George P. Hitchings, concurred with "new car sales of 6 million, including imports."

December production was higher than the year-ago figure at all companies except strike-bound Chrysler. As an example, Chevrolet set an all-time record of 188,410 passenger cars, nearly 7000 better than the previous high set in November, 1955.

Sales gains for December were reported by Ford, Cadillac, Oldsmobile and Pontiac.

A rundown of 1958 production figures shows only American Motors with an increase. AMC boosted output from 114,084 cars (including some Nash and Hudson models) a year ago to 217,332 Ramblers in 1958. This is a 90.5 per cent increase.

Chrysler production fell 53 per cent, Ford 30.2 per cent, S-P 24.1 per cent and GM 23.1 per cent. Chrysler ended with a total of 581,244 cars, Ford 1,219,422, GM 2,169,186 and S-P 55,092 units.

New Four-Cylinder Engine Powers A-C Model D Grader

A new four-cylinder engine has been announced by Allis-Chalmers to power the Model D Motor Grader. The new gasoline engine is rated at 58 hp at 1650 rpm and has a 7:25 compression ratio.

A-C says its new engine ranks the Model D tops in horsepower among motor graders in the 880 lb field. Extra power and peak performance on regular grade gasoline make the new unit economical to operate, according to the manufacturer.

Offered along with the new rear-mounted engine are an increased capacity 11 in. diameter heavy duty clutch and a 13⅜ in. flywheel that A-C says provides easy starting, smooth idling, and general overall smooth operation.

Mack Moving Bus Manufacture From Ohio to Pennsylvania

Mack Trucks, Inc., will close down its Sidney, O., plant and move the manufacturing operation to Allentown, Pa. The Sidney plant makes the 97D cross-country bus and fire-fighting equipment. Mack took over the Sidney plant in 1956 from C. D. Beck & Co.

U. S. PASSENGER CAR PRODUCTION

	1958	1957
American Motors Corp.		
Hudson	....	1,345
Nash	....	3,561
Rambler	217,332	109,178
Total	217,332	114,084
Chrysler Corp.		
Plymouth	367,296	655,526
Dodge	114,206	292,386
De Soto	36,556	117,747
Chrysler	49,513	118,733
Imperial	13,673	37,946
Total	581,244	1,222,338
Ford Motor Co.		
Ford	1,038,560	1,522,408
Mercury	128,428	274,820
Edsel	26,563	54,607
Lincoln	25,871	37,870
Total	1,219,422	1,889,705
General Motors Corp.		
Chevrolet	1,255,943	1,522,549
Pontiac	219,823	343,298
Oldsmobile	310,795	390,091
Buick	257,124	407,271
Cadillac	125,501	153,236
Total	2,169,186	2,816,445
Studebaker-Packard Corp.		
Packard	1,745	5,495
Studebaker	53,347	67,394
Total	55,092	72,889
Industry Total	4,242,276	6,115,461

Car Makers Showing Interest In Variable Ratio Steering

Car makers are showing more interest in variable ratio steering. At least two manufacturers are expected to adopt some form of variable ratio in 1960 models.

Currently, Studebaker - Packard Corp. is using two variations on its new Lark passenger car. One, a cam and twin lever system, is used in the standard manual steering. This has a 13.5 to 1 numerical ratio in the center, for straight ahead driving, and a 15.4 to 1 ratio at the ends for cornering.

The other, using a cam and single roller stud, has a center ratio of 22 and end ratios of 20. This system is available on Lark 8-cylinder models.

Since the systems under study by Big Three members for 1960 are planned for power steering applications, the high numbered ratio would be in the center, as in the second Lark system.

Variable ratio steering has the advantage of steady control in the center for regular straight ahead driving, plus rapid response and fewer wheel turns for cornering and parking. According to Ross Gear and Tool Co., which makes the Lark systems, extreme end variations were not possible without power steering to do the work.

Now, says Ross, it is possible to reduce the number of wheel turns to 2½ or 3 turns from lock to lock and still provide the same rate of control in the center position to satisfy safety requirements.

Ross lists a variable ratio of 12:-20:12 as an example. Twelve to 1 ratio for cornering, with only three turns from lock to lock, with 20 to 1 center ratio for control.



"OFF-ROAD" TRUCK USES AIR BAGS INSTEAD OF WHEELS

This unique cargo transport, known as the Arc, can carry a 7-ton payload over all types of terrain. Developed by Albee Rolligon Co. of Monterey, Calif., the vehicle is equipped with six pneumatic bags in place of wheels. Bags are friction-driven from above by rollers. Another feature is a plastic cab made with Isophthalic, the new chemical developed by Oronite Chemical Co. Cab weighs only 450 lb, compared with 1500 lb for a steel cab of comparable size.

Chevrolet's Sattler Predicts 25 Percent Truck Sales Rise

Total truck sales during 1959 should increase by at least 25 per cent, according to Herman P. Sattler, Chevrolet's assistant general sales manager in charge of trucks.

During the first 20 days of December, retail deliveries of Chevrolet trucks topped 18,000, an increase of 38.5 per cent over the same period of 1957. Sattler contends that deliveries would have been higher had it not been for the October strike at Chevrolet's production plants.

On an industry basis, Sattler pointed out, "hundreds of thousands of truck purchases have been deferred temporarily," while economic dependence on trucks continues to increase. At the same time, scrappage rate of trucks during the last five years has been between 5.4 and 6.3 per cent. Passenger car scrappage during this period has ranged from 7.4 to 8 per cent.

This, according to Sattler, indicates an increased need for truck replacement. Average age of trucks is now 7.2 years.

Ford Div. also reports a strong truck finish for 1958. The division's Super Duty line had its best month on record during November, with a selling rate 50 per cent higher than the average for the nine months since the heavy line was introduced.

Goodyear Plans Rise in Capital Spending for '59

Goodyear Tire & Rubber Co., banking on a 10 per cent rise in tire sales in 1959, plans a capital expenditure of $70 million during the year.

E. J. Thomas, board chairman and chief executive officer, said the budget for '59 is $10 million higher than in 1958.

He predicted that the automobile industry will buy 25 to 30 per cent more tires and other rubber goods during 1959. Goodyear, he said, already has recalled 65 per cent of its laid off workers in anticipation of the upswing.

Thomas agreed with earlier estimates that total pneumatic tire production would rise from about 102 million in 1958 to 112 million units in 1959, and that replacement passenger car tire sales would increase by 2 million units to around 62 million.

Total passenger car tire sales should top 82 million units, and rubber consumption should increase from 1,345,000 tons in 1958 to 1.5 million tons this year, Thomas added.

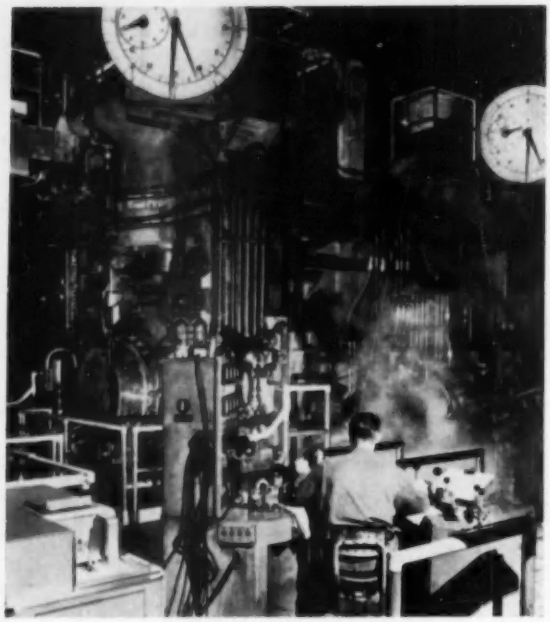
AC Spark Plug Div. Creates Four Engineering Departments

AC Spark Plug Div. of General Motors has set up four new engineering departments to cover commercial products, missile and space vehicle guidance, gyro and component development, and advanced development.

Leo W. Tobin, Jr., division general manager, says the new departments have been set up as part of a long range program aimed at leadership in the fields of missile guidance and military electronics.

Named department heads were Bruce H. Schwarze, Commercial Engineering; Donald F. Ayres, Gyro, Components and Engineering Services; Dr. Joseph F. Shea, Advanced Systems Engineering and Research; and Dr. James H. Bell, Guidance and Navigation.

NEWS AUTOMOTIVE AND AVIATION



ROLLING MILL

The aluminum industry's first electronically controlled rolling mill is now in operation at Aluminum Co. of America's Davenport (Iowa) works. An automatic system follows instructions punched on IBM cards to establish mill speed and roll opening for a 160-in. reversing mill. The mill rolls 16-in. thick billets into 3 to 4 in. thick slabs. The card-programmed control system — called Prodac — is a Westinghouse Electric Corp. product.

Kaiser To Use Alfa Body For Argentine Small Car

Industrias Kaiser Argentina will begin production next fall of a small passenger car for the Argentine market.

The car will have a four-door sedan Alfa Romeo body, and will be built at the Cordoba plant of IKA, an affiliate of Willys Motors.

The body will be built under license from the Italian manufacturer. The four-cylinder engine and other components will be IKA's own, made in the Argentine.

The Buenos Aires based company already is manufacturing a passenger car, the Carabela, a standard-sized six-cylinder car similar to the 1955 Kaiser Manhattan. IKA also is producing Jeep vehicles.

Current plans call for 1959 production of 32,500 Jeeps, 3500 Carabelas and 1350 small cars.

Aluminum Poses New Problems, GM Research Chemist Warns

Aluminum engines, said to be just around the corner, will pose new corrosion problems that current antifreezes and rust inhibitors may not be able to handle, according to a General Motors research chemist.

Pitting and galvanic corrosion are sure to be more prominent when aluminum is used in automobile engines and cooling systems, according to Leonard C. Rowe of GM's Research Laboratories Chemistry Department.

Rowe told the Chemical Specialties Manufacturers Association that chemical manufacturers will have to provide materials which are effective in light metal cooling systems, or different cooling methods must be found.

He said further study is needed in water quality, heat transfer, surface boiling, hot spots, low velocity coolant areas and other aspects of corrosion.

Los Angeles and Detroit Join Battle Over Smog

As the new year opened, the city of Los Angeles virtually declared war on Detroit—or, at least, on Detroit's major industry. The issue was the long-smoldering question of who (or what) is responsible for smog.

The skirmish opened up in late December with the mayors of the two giant population centers taking verbal pot shots at each other and at their respective cities.

Mayor Norris Paulson of Los Angeles fired the first shot when he refused delivery on a 1959 model passenger car with a large engine. He said he would prefer a smaller car with a smaller engine, because big cars and heavy engines of recent vintage are the major cause of the eye-smarting smog.

The Los Angeles city council has asked for a ban on sale of automobiles after Jan. 1, 1961 unless they have anti-smog equipment. The council planned to ask for legislation which would make the ban statewide.

Detroit's Mayor Louis Miriani said the West Coast officials are not realistic in their approach. "My suggestion is that they ban the old cars and get new ones," said Miriani. Miriani added that if the Californians' complaints continue, "Los Angeles will become a foreign country all by itself, completely isolated."

In a more serious vein, Secy. of Welfare Arthur Fleming reported in Washington that the Public Health Service is concentrating on the relationship of air pollution and automotive exhaust gas. "More of our manpower and funds are being invested in this than in any other single aspect of the air pollution problem," he said.

The Public Health Service and the automobile industry have been working on a joint project for study of exhaust gases. In the past five years, the automobile industry has spent some $5 million on studies and development of a suitable afterburner or other control device.

Willys Gets Order for More Cargo-Personnel Carriers

Willys Motors Inc. received an Army Ordnance contract for more proto-type units of its lightweight cargo-personnel carrier XM443E1. The ¾ ton vehicle, an offshoot of the lighter Mechanical Mule, is under study by the Army and will be studied by the Marine Corps.

The contract calls for March delivery of two vehicles to the Army and two to the Marines. Army and Marine Corps units currently are using the Mule.

Seats on the prototype XM443E1 fold flush to the platform top to form a flat weapons carrier that can be steered by a walking operator.

New SBA Agency Will Help Small Firms Get R&D Work

The Small Business Administration has set up a new agency to help small firms get more research and development work.

Wendell B. Barnes, SBA administrator, said the new agency will also aid small business in getting R & D data from projects done under Government contract, as well as provide technical help in carrying out applied research.



Leonard Raymond

Leonard Raymond Elected SAE President for 1959

Leonard Raymond, chief automotive engineer - research of Socony Mobil Oil Co., was elected president of the Society of Automotive Engineers for 1959.

Raymond, who was head of the SAE Publications Committee last year, succeeds William K. Cresson, Ross Gear and Tool Co., Inc., consulting engineer.

Raymond's election was announced on Jan. 14 at the society's annual meeting in Detroit.

Hall Prexy Sees 50 Per Cent Rise in Parts Industry Sales

A 50 per cent increase in gross sales by the automobile parts industry is forecast for 1959 by Harry Hirsch, president of C. M. Hall Lamp Company.

Such an increase, coming as it would on the heels of a disappointing 1958, would be substantial even in comparison with 1957. Hirsch estimates gross sales of around $3.3 billion for 1959, compared with an estimated $2.2 billion for 1958.

As for Hall Lamp, Hirsch said the company ended 1958 with gross sales of some $10 million, one of the highest years on record and better than 1957.

Leece-Neville Offers Kit For Conversion to Silicon

Leece-Neville has announced a kit for quick conversion of L-N alternators with six-cell silicon rectifiers.

The new silicon rectifiers, according to Leece-Neville, are more economical than selenium rectifiers, and provide greater performance and higher rating.

As an example, L-N says a standard alternator rating of 12 volt, 50 amp is increased to 12 volt, 60 amp with the new rectifier. Any of the six hermetically sealed cells can be replaced individually.

A1 TABLOID

Jones & Laughlin Steel Corp. is marketing a new series of steels for use in nuclear applications. By holding the new steels to an extremely low manganese and cobalt content—both metals are radioactive when subjected to bombardment by thermal neutrons—the company claims it can provide steels with the best combination of nuclear and mechanical properties.

* * *

A miniature pilot plant (completely automated) has been built by Consolidated Electrodynamics Corp. in cooperation with Esso Research and Engineering Div. The new plant measures, records and controls temperatures, pressures and stream compositions. Designed to speed petrochemical research, it will be installed at Esso's Bayway refinery in Linden, N. J., where its first job will be to work out better catalysts for a catalytic reforming technique.

* * *

Harvey Aluminum has added titanium castings to the line of mill products produced at its Torrance, Calif., plant. To make the castings, Harvey uses a closed consumable electrode furnace in which a high vacuum or inert gas atmosphere is maintained. Harvey claims its process not only protects the metal from oxygen or nitrogen, but also eliminates carbon or tungsten contamination.

* * *

A grit blast machine that solves the problem of preparing aircraft tires for balancing has been installed at the Akron, O., plant of Goodyear Tire & Rubber Co. The machine cleans the inside of the tire and conditions the surface to produce a strong and consistent bond with the balance dough or patch, Goodyear says.

* * *

Urethane foam is now being used to protect missile nose cone instruments from impacts up to 45,000 times the force of gravity, says Du Pont Co. The delicate recording devices are embedded in a core of soft foam, which is covered by an outer shell of hard foam. An outer covering of another material is wrapped around the package to protect it from heat when it re-enters the atmosphere.

Electric motors for use in aircraft can be made 30 per cent lighter—while delivering the same horsepower—by using a Westinghouse Electric Corp. insulating varnish to impregnate the stators, according to Task Corp., Anaheim Calif. The varnish (Type B-161), used for treating coils and insulation in integral horsepower motors, generators and transformers, cures to a tough, flexible film that resists heat, oil, moisture, acids, and alkilis.

* * *

Recation Motors Div., Thiokol Chemical Corp., has come up with a packaged liquid-fueled rocket engine that eliminates the long expensive fueling process just before firing. The engine can be stored and taken out of inventory before firing—just like the solid-fuel variety of rockets. It has a thrust of 50,000 lb compared with the non-packaged Atlas engine with a thrust of 270,000 lb.

* * *

General Motors' Harrison Div. is conducting research on a small gasoline heater, which—it is reported—will be installed on GM's proposed small U. S. designed car. Harrison also says it is working on development of a car heater that derives its heat from the exhaust system, thus adding weight to the speculation that GM's new car will be aircooled rather than water-cooled.

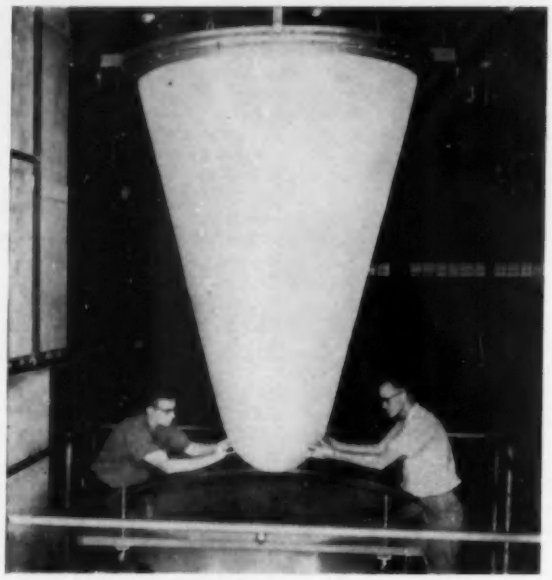
* * *

Fairchild Engine and Airplane Corp. has licensed Kelsey-Hayes Co. to use its Al-Fin molecular bonding process in the production of bi-metallic integral wheel drums for passenger cars. General Motors Corp. is producing the bimetallic drum under a similar Al-Fin license at its Fabricast Div. plant.

* * *

Stainless steel rings machine-cut to size are ready for use without further machining, says Joseph T. Ryerson & Son, Inc. These advantages are claimed: size accuracy within plus or minus 1/32 in.; smooth edges; normal flatness of plate is retained; and corrosion resistant qualities are undisturbed.

AVIATION MANUFACTURING



NOSE CONE

Missile nose cone — one of first to be mass produced — is lifted from bonding fixture at Goodyear Aircraft Corp.'s Akron (Ohio) plant. Using a common thermo protection material, Goodyear engineers working with the Army Ballistic Missile Agency developed the cone and designed the production tools. Goodyear is supplying cones to Chrysler Corp. Jupiter prime contractor, as well as to the ABMA.

Republic to Build Jet Drone Under $25 Million Contract

Republic Aviation Corp. is developing a small jet surveillance drone for the Signal Corps under a $25 million contract, the Army announced.

The contract calls for design and production of airframe, guidance controls, surveillance data presentation and reduction, and transport vehicle and launcher.

Robert G. Melrose, general manager of Republic's Guided Missile Div., said the new drone, called Swallow, will be fired from a special zero-length launcher with the aid of rockets. Once airborne, the rockets will separate from the drone and the turbojet engine will take over.

Missions can be carried out by a preprogrammed automatic guidance system or by ground or air control systems, Melrose said. Recovery will be by parachute.

Pentagon Economy Drive Bears Heavily on Guided Missiles

Air-breathing guided missiles may bear the brunt of the current Pentagon drive to economize on missile procurement.

Regulus II, a well tested jet, or air breather, is the latest missile on which production has been cancelled. Developed by Chance-Vought Aircraft Co. for fleet use by the Navy, Regulus II has been dropped to save money. Navy estimates that cancellation will save $100 million.

Chance-Vought designed its missile to fly at ranges of more than 1000 miles at speeds ranging up to Mach 2. Now Regulus II joins the rocket-powered Rascal and the long-range decoy, Goose, as a cancelled weapon. Both Rascal and Goose, dropped in late November, were Air Force missiles.

The Air Force with the Snark, Matador, and Mace—all jet types—in its missile arsenal recently negotiated a $50 million contract with Northrop Aircraft Inc., for production of additional Snarks. The new contract will continue the Snark program through December, 1960.

Metal Sandwich Breaks 2000 F Heat Barrier, Republic Says

Republic Aviation Corp. has developed a new kind of metal sandwich for supersonic jets that it says can withstand as much as 2000 F while under severe pressure.

The sandwich is made of a corrugated metal filler with a flat "bread" sheet on either side, using stainless steel, Inconel X, or other high-temperature metals.

Key to Republic's success in developing the new sandwich is a new manufactuirng technique, according to Adolph Kastelowitz, Republic chief of manufacturing research and development.

Instead of adhesives, which melt at comparatively low temperatures, Kastelowitz said, the company uses electrical resistance welding to fuse the pieces together. Results are accurate to 0.003 in. on the thickness of the sandwich. Sheets as large as 16 sq ft have been fabricated.

Kastelowitz said that corrugated panels cost about 75 per cent less than sandwich made with a honeycomb filler. The new production technique has been so successful, he added, that panels are now being made under subcontract for a supersonic Air Force fighter.

Grumman to Build $4 Million Avionics Engineering Facility

Grumman Aircraft Engineering Corp. announced plans to build a 55,000 sq ft avionics engineering laboratory at its Bethpage, N. Y., facility.

Oscar F. Olsen, Grumman manager of avionics, said the new laboratory will cost about $4 million and will feature a systems evaluation area that "will greatly reduce development time for future aircraft."

The new facility will include a roof-top radome for testing airborne early warning systems; an indoor radio-frequency chamber for testing antennas; an electrical systems facility which can house up to six 200-hp generators; and a flight-control-simulator laboratory, which can duplicate "actual mission" situations by electrically transmitting problems from electronic computers.

Chrysler Gets New Orders For Missile, Tank Work

Chrysler Corp. has received new Defense Dept. orders totaling $7.8 million for additional Jupiter missile and M-48 tank work.

One contract for $5.95 million calls for engineering services on the Jupiter system; another $1.84 million order calls for modification work on existing tanks. Work would be carried out in Chrysler's Sterling and Centerline plants outside Detroit.

Improved Cessna 310C Has Two 260-Hp Engines

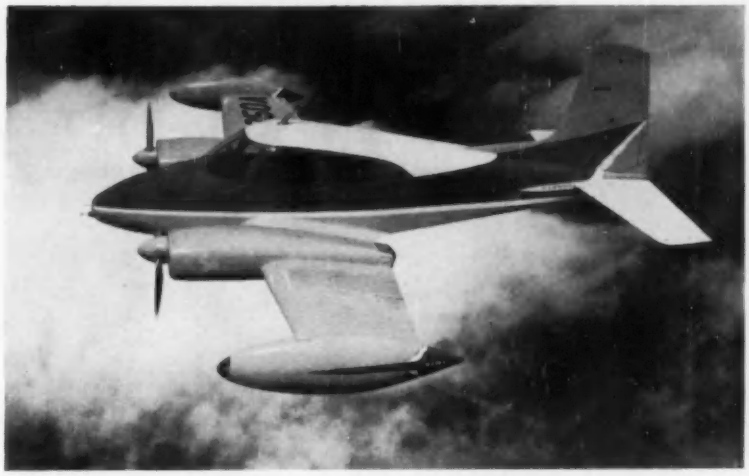
Cessna Aircraft Co. announced a new twin-executive Model 310C for 1959 that features improved performance and changes in interior and exterior styling.

Newest addition to the model are two Continental six-cylinder engines with fuel injection, which boost top speed to 242 mph and cruising speed to 220 mph.

Rate of climb is up from 1660 fpm in the B model to 1800 fpm. Gross weight has increased 130 lb to 4830 lb, and useful load is up 75 lb—from 1735 to 1810 lb.

The Continental IO-470-D engines are rated at 260 hp each at 2625 rpm. The engine air intake system has been redesigned to include a removable air filter and a spring-loaded door, which provides an alternate air source automatically.

Cessna officials said that although the 310C has more improvements than any previous model, its price would remain unchanged at $59,950.



Cessna 310C has cruising speed of 220 mph

Battelle Team Probes Method To Predict Jet Engine Failure

A research team from Battelle Memorial Institute is trying to find a reliable method of predicting jet engine failures and malfunctions.

The team aims to develop a simple totalizing recorder - computer that could be installed on jet engines to predict service life or the need for maintenance, says Fred Bagby, chief of Battelle's division of aeronautics and thermodynamics.

At part of its study, the team is gathering engine flight-test data by means of recording oscillographs over a period of two to three years, with single runs lasting up to 16 hours.

Data from these flights are scanned for abnormal engine operation and instrument malfunction and are then put on punch cards and stored for later study.

When engines malfunction, the stored data are correlated with engine condition to indicate the functions that may predict engine life.

Vanguard Turboprop Slated For Airline Service in 1960

The new Vickers Vanguard turboprop—a bigger version of the Viscount—is scheduled to begin service with British European Airways and Trans Canada Airlines in 1960.

The transport, which seats 139 coach class passengers, made its first flight in December from a small airfield adjacent to the main plant of Vicker Armstrongs (Aircraft) Ltd.

The Vanguard is powered by four Rolls-Royce Tyne turboprops with take-off power rated at 5525 ehp at 15,250 rpm. It has a cruising speed of 425 mph at 20,000 ft.

Its "double-deck" fuselage includes two cargo holds with a combined volume of 1360 cu ft. It has a wingspan of 118 ft, and overall length of 122 ft.

Allison and Cornell Team Up On Weapon and Missile Program

Allison Div. of General Motors Corp. and Cornell Aeronautical Laboratory have launched a joint program of advanced weapon and missile studies.

The plan includes a $50,000 research grant to Cornell for work on advanced weapons system concepts. As part of the study program a group of Allison engineers will receive training at the laboratory in analysis and design problems of surface-to-surface missile systems.

Dana and Aircraft Armaments Form Team for Defense Work

Dana Corp. of Toledo, O., and Aircraft Armaments, Inc., of Cockeysville, Md., have agreed to cooperate in the development and production of military equipment.

The new defense team will combine the production experience of Dana's 11 divisions with the broad systems engineering approach of Aircraft Armaments, according to the announcement by Dana president J. E. Martin and Aircraft Armaments' vice president J. M. Jacobson.

Dana Corp., a major supplier of automotive parts, is currently producing motors for the Army's LaCrosse artillery missile, as well as transmissions, universal joints, axles, and power takeoffs for a wide variety of military vehicles.

Aircraft Armaments, producer of electronic and electromechanical devices, has been active in the field of specialized equipment for military as well as civilian air navigation use.



Vanguard turbo-prop airliner is readied for maiden flight

AVIATION MANUFACTURING



TERRACRUZER HAULS MATADOR MISSILE

The Terracruzer, designed and built by Four Wheel Drive Auto Co., can haul guided missiles at high speeds over all kinds of terrain. Here it is pulling a Goodyear Aircraft Corp. launching trailer for the Matador guided missile. Vehicle weighs only 15,000 lb, but carries a 16,000-lb load at 40 mph on paved roads or at speeds up to 24 mph overland. Constructed mostly of aluminum, many of its components are Sigma and Heliarc welded to stand up under combat conditions.

GM Agrees to Repay Uncle Sam $9.9 Million on AF Contracts

General Motors Corp. will wind up a long controversy over cost accounting on Government contracts by repaying some $9.9 million to Uncle Sam.

In making the repayment, however, GM insists that it has never "wilfully made any misrepresentations of its costs and its settlement payment was based on the difference between estimated and actual costs."

Justice Dept. officials say GM agreed to repay $4.9 million and voluntarily returned another $5 million in alleged excess profits. Involved is a 1952 Air Force jet plane contract.

The Government asserted that the $4.9 million was overpaid to GM through accounting errors and "misstatements of costs" in pricing proposals.

Of the total, almost $2 million represents amounts due under laws permitting civil recovery to the Government beyond actual damages.

Frederic G. Donner, GM chairman, said the settlement is based on a proposal "initiated by General Motors." The controversy was the result of a misunderstanding between the corporation and Air Force contracting officers, and the firm "does not wish to profit through a misunderstanding," Donner added.

He pointed out that the Air Force has commended GM's performance on the contract as "phenomenal" despite extreme manufacturing difficulties.

Westinghouse Gets New Award For Bomarc Guidance Systems

Westinghouse Electric Corp. has received a contract for more than $10 million to build additional guidance systems for the Bomarc.

Dr. S. W. Herwald, manager of the Air Arm Div., said the new award brings the total value of Bomarc contracts to about $60 million.

Production of Bomarc target seekers will run through 1960 on the basis of existing contracts and the new award from Boeing Airplane Co., prime contractor for the Bomarc, Herwald said.

Hamilton Standard to Develop Cabin Air Systems for B-70

The pressurization and air conditioning systems for the North American B-70 Valkyrie bomber and F-108 interceptor will be developed and built by Hamilton Standard Div. of United Aircraft Corp.

The two airplanes, which will operate at speeds of more than 2000 mph and altitudes of 70,000 ft, will be subjected to temperatures as high as 600 F, according to North American engineers.

The dollar value of the contracts was not disclosed.



BRITISH MOBILE CRANE LIFTS OVER 20 TONS

British mobile crane for aircraft rescue work has shear legs fitted to the 40-ft jib to form a tripod, increasing its lifting power to over 20 tons. The Jones KL 10-10 uses a single engine for traveling, derricking, hoisting, and slewing. All controls are in the cab. Power unit is a 125-hp Leyland Diesel driving through a five-speed transmission to the three live axles. Only one driver/operator is needed.

MEN IN THE NEWS



Milford Rivet & Machine Co. — R. M. Gordon has been named vice-president, sales.



Federal-Mogul-Bower Bearings, Inc., Bearings Divs.—Russell S. Strickland has been promoted to vice-president—general manager; and Robert E. Klare to vice-president—operations.



Babcock & Wilcox Co.—Dr. Lauchlin M. Currie has been elected a vice-president and is now head of the Atomic Energy Div.

Youngstown Sheet & Tube Co.—**Robert P. Bremmer** was elected vice-president, raw materials; **Donald S. Day**, vice-president, traffic; **Dr. Karl L. Fetters**, vice-president, research and development; and **James D. Sloan**, vice-president, purchasing.

Dana Corp.—**L. L. Dodge** was elected vice-president—administration, and **C. C. Dybvig**, vice-president—sales.

AC Spark Plug Div., General Motors Corp. — **John T. Rausch** was named assistant chief engineer in charge of motor group of products.

B. F. Goodrich Co.—**Charles H. Sturgeon** has been appointed general traffic manager.

Crucible Steel Co. of America, Spring Div.—**William R. Mogg** was appointed sales manager.

Standard Oil Co. (Indiana)—**Amos K. Smith** has become manager of the sales promotion and sales training department in the general office at Chicago.

Chrysler Corp., Airtemp Div.—**Raymond J. Thompson** was made director-national service, and Warren **Fitch**, director-distribution.

Pontiac Motor Div., General Motors Corp.—**Basil B. Kimball** retired as assistant to the general sales manager.

Rheem Mfg. Co.—**Robert G. Belote** and **George J. Papas** were named vice-president-industrial relations and vice-president-purchasing, respectively.

Oakite Products, Inc.—**J. D. Rogers** and **R. A. Nederman** have been named technical service representatives in Houston and Kansas City, respectively.

Chrysler Corp.—**A. G. Wahle** was appointed manager of sales promotion.

Dayton Rubber Co., Mechanical Goods Div.—**William O. Blandford** was appointed assistant to the merchandising manager.

Atlas Drop Forge Co.—**William E. Vogel** has been appointed plant manager.

Square D Co.—**Mitchell P. Kartalia** was elected a vice-president.

United Aircraft Corp., Hamilton Standard Div.—**Wendell W. Suydam** was named assistant purchasing manager.

General Drop Forge Co.—**John J. Morrissey** has been elected a vice-president.

United States Chemical Milling Corp.—**C. B. Ferenbaugh** has been appointed stag assistant to the president.

Fairchild Engine and Airplane Corp. —**Dr. Merit Scott** has joined the Applied Sciences Div. as scientific advisor.

Heil Co., Body & Hoist Div.—**Glenn S. Park** has been named chief development engineer.

American Metal Products Co.—**Floyd S. Laurie** has retired and **Ernest G. Ott** succeeds him as manufacturing vice-president.

Norton Co.—**John W. Peterson** has been appointed a field engineer at the Philadelphia district office.

General Tire & Rubber Co.—**Frank R. Rebek** has been promoted to Detroit division manager.



Diamond T Motor Truck Co.—William L. Cook was promoted to executive engineer.



Fuller Mfg. Co. — Charles M. Perkins has been promoted to chief engineer.

Necrology

Ralph C. McQuire, 63, manager of Nickel Refining Div. of International Nickel Co. of Canada, died Dec. 23, at Port Colborne, Ont.

Frederick A. Haas, 59, retired buyer in the purchasing department of Willys Motors, Inc., died Dec. 12.

Verne E. Minch, 91, founder of Wheelabrator Corp. and honorary chairman of the board, died Dec. 13, at New York City.

W. M. Gifford, 73, retired vice-president and general manager of Aluminum Co. of Canada, died Dec. 11, at Toronto, Ont.

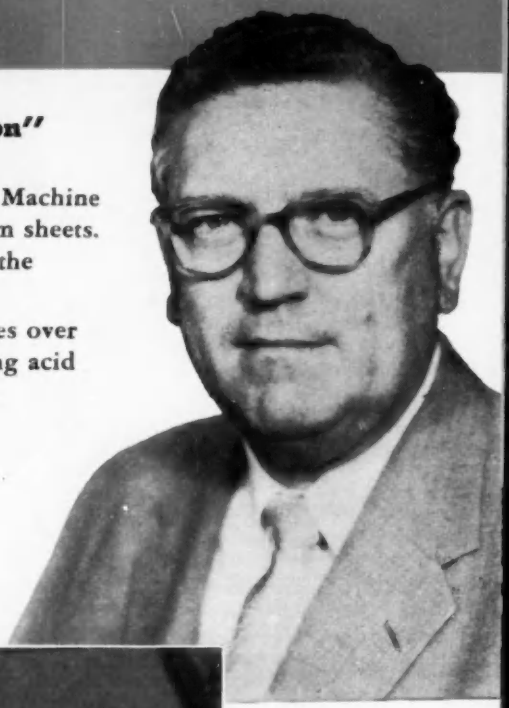
John J. Stamm, 79, retired secretary and treasurer of A. O. Smith Corp., died Dec. 10, at Milwaukee, Wis.

Joseph T Lawler, 62, president of Mac-Law Tool Aircraft Parts Corp., died Dec. 7.

A. L. Elliott, 66, retired vice-president of International Harvester Co of Canada, died Dec. 5, at Hamilton, Ont.

"...an all-round solution to the problem of removing scale from sheets"

says T. A. SULLIVAN, Plant Manager,
Granite City, Ill. Works, A. O. Smith Corporation

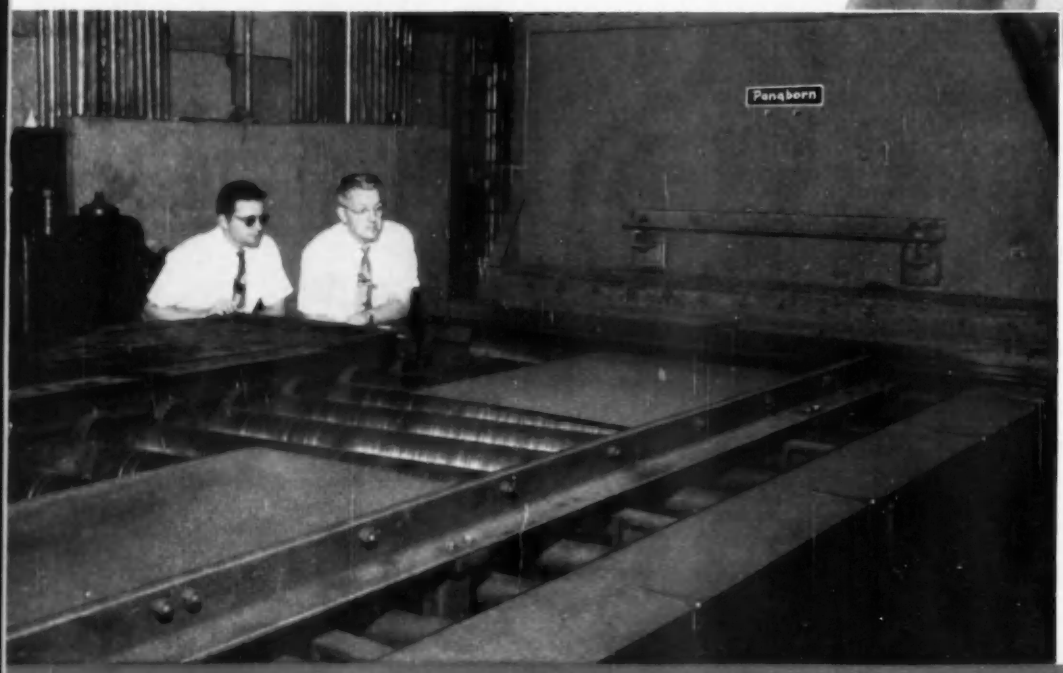


"Extremely pleased with high volume of production" of PANGBORN DESCALING MACHINE

"In many ways," says Mr. Sullivan, "the Pangborn Descaling Machine is an all-round solution to the problem of removing scale from sheets. We're extremely pleased with the high volume of production the machine is handling . . . it's fast and thorough."

And A. O. Smith management rates the following advantages over pickling equally important: conserving floor space—eliminating acid disposal problems and hazards to employees—better working conditions and plant housekeeping—more fully automated plant that saves time and labor.

If you're descaling sheets, plates, coils and rods, write today for Bulletin 608, PANGBORN CORP., 3900 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning & Dust Control Equipment.*



At A. O. Smith, sheets descaled on this Pangborn Descaling Machine draw easily, weld readily . . . and the fine matte surface takes a permanent bond.

Circle 133 on Inquiry Card for more data

Pangborn cleans it fast with ROTOBLAST®

Putting the open road

into a closed tunnel!



This automotive wind tunnel at Modine Manufacturing Company (Racine, Wis.) is the scene of A-P air conditioning controls testing. All factors are controlled from panel. For example, air temperature can be raised to 135° while wind velocities ranging from 1 to 110 miles per hour can be created. Engine power at equivalent road speeds of 1 to 80 miles per hour on level road or steep mountain grades are recorded by "dynamometer."

A-P air conditioning controls are tunnel-tested to duplicate actual road and weather conditions

OUTSTANDING among research and testing techniques employed by Controls Company of America on its automobile air conditioning controls is the use of this modern wind tunnel.

Vehicles operate in the tunnel on dynamometer test stand under conditions identical to those encountered on the open road — atmospheric temperatures, wind velocities and road grades are perfectly controllable. Thus, it is possible to simulate, at any season of the year, any combination of road and weather conditions affecting operation of air conditioning controls.

Pioneering such as this is another reason to look to A-P for your *complete* needs. For whatever the air conditioning system — thermostatic by-pass, pressure actuated by-pass or any other — A-P will supply standard controls in any quantity or design special controls to fit any specific requirement.

And more than 400 jobbers give coast-to-coast coverage for future replacements. Write today for new comprehensive bulletin.



MODEL 207-C THERMOSTATIC EXPANSION VALVE — Adjustable or fixed superheat. Pressure limit on special order. Internal or external type equalizer. 1-ton or 1½-ton capacities, R-12.

MODEL 206-J THERMOSTATIC EXPANSION VALVE — Non-adjustable (factory set) superheat, with or without pressure limit. Choice of internal or external type equalizer. Cap. 1 or 1½ tons, Ref. 12. Small, compact size — most popular valve in automobile air conditioning.





MODEL 412 DRIER-RECEIVER with sight glass. PA-400 silica gel protects 100% against acids and moisture. Capacities: up to 3 tons.

PRESSURE-TYPE DISTRIBUTORS — uniform flow to all circuits. Any size and number of outlet openings; also side openings for by-pass connection if required.



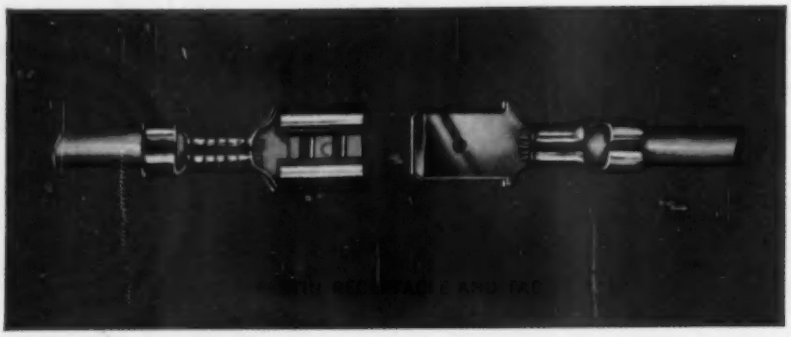
CONTROLS COMPANY OF AMERICA

Manufacturers of A-P CONTROLS

2415 N. 32nd St., MILWAUKEE 10, WIS.
COOKSVILLE, Ontario • NIJMEGEN, Holland

Controls That Make Modern Living Possible

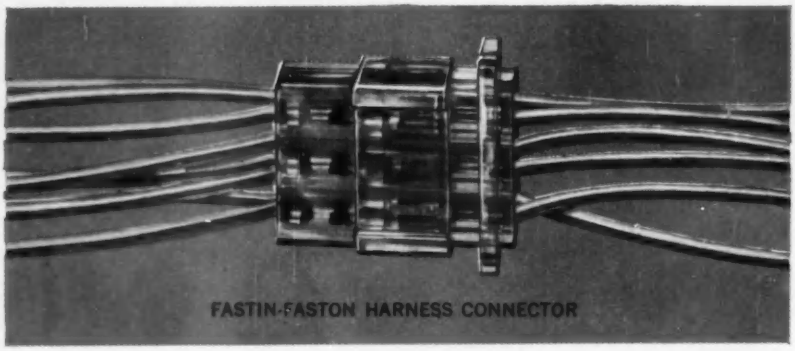
Circle 133 on Inquiry Card for more data





ECONOMY TAILORED TO YOUR CIRCUITRY REQUIREMENTS





THE A-MP FASTON® LINE

It terminates the best circuits in the appliance and automotive fields. It's an A-MP Automachine product featuring remarkable production rates. It offers the highest reliability and . . . the total installed cost is lower than anything you're now using.

That's the A-MP Faston® line.

Equally important, the A-MP Faston receptacle has outstanding vibration resistance, a broad temperature tolerance range and uniform performance in quantities of one or a million. Made in single circuit units (flag or straight receptacles) and Fastin-Faston connector units (one or six circuits), this A-MP line offers unbeatable versatility to fit practically any circuit connection requirement in tab width .250, .205, .187, and .110.

If you are not specifying "A-MP" to save on your circuitry design and production costs, send today for the new A-MP Faston Catalog.

AMP INCORPORATED

GENERAL OFFICES: HARRISBURG, PENNSYLVANIA

A-MP products and engineering assistance are available through subsidiary companies in: Canada • England • France • Holland • Japan



LOOK TO CARTER . . . FOR DYNAMIC DEVELOPMENTS
IN THE NEXT 50 YEARS OF AUTOMOTIVE PROGRESS

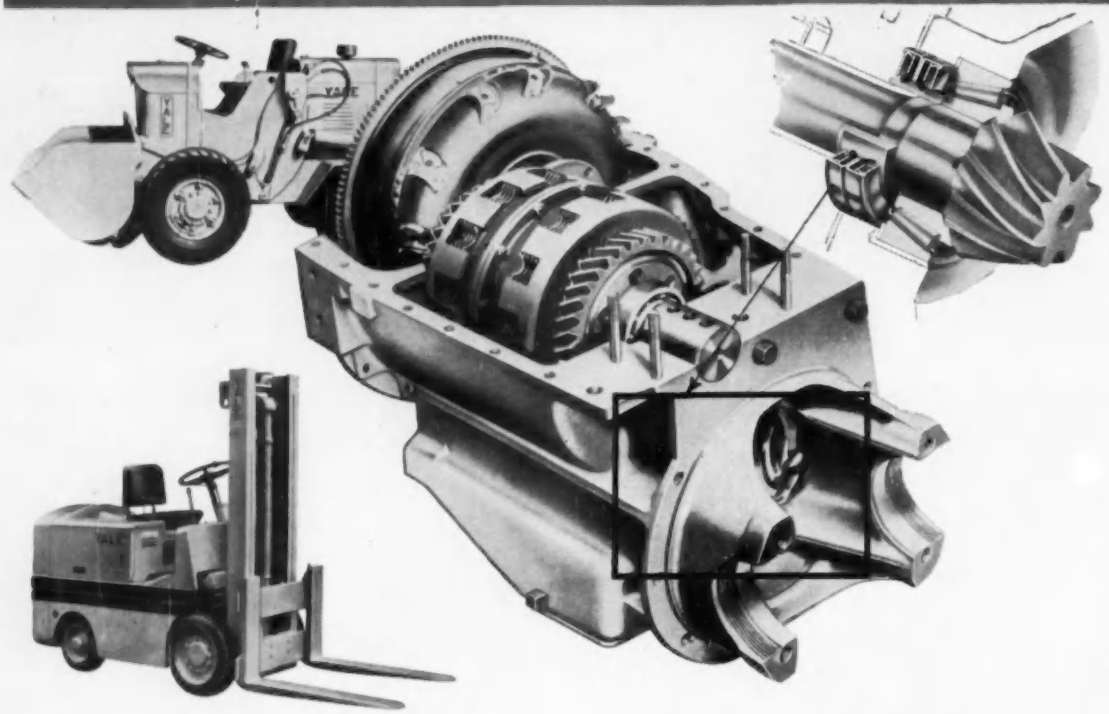
CARTER CARBURETOR

DIVISION OF acf INDUSTRIES, INCORPORATED

ST. LOUIS 7, MISSOURI

Circle 135 on Inquiry Card for more data

NATIONAL OIL SEAL LOGBOOK



Oil seals "back-to-back" in torque transmission of Yale industrial tractor shovels

In both their new industrial tractor shovels and the famous KGA51 series lift trucks, Yale and Towne employ National Seals to separate transmission oil from differential lubricant. The seals are used at the pinion position of the unique, fully automatic Yale Torque Transmission. This assembly is basically a combination of a torque converter and a constant mesh transmission eliminating gear shifting.

Pinion sealing almost always presents unique demands on oil seals; performance must be of the highest order since most pinion seals are difficult to reach for replacement after assembly, and repairs to adjoining assemblies are costly.

To assure long-term, trouble-free performance for their customers, Yale and Towne install two 50,000 series National Seals at the pinion position. The seals are mounted back to back, one with its lip facing and retaining transmission oil; the other with its lip facing and retaining differential lubricant. Both seals used are standard-design National Micro-Torc leather seals with precision-made tension springs insuring optimum seating of lip on shaft.

National offers over 2,500 different standard-design oil seals — leather, synthetic rubber or felt. National Seal engineers are at your service—they're listed under Oil Seals in the Yellow Pages.

NATIONAL SEAL

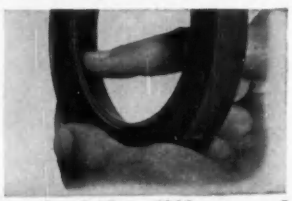
Division, Federal-Mogul-Bower Bearings, Inc.
General Offices: Redwood City, California
Plants: Van Wert, Ohio, Redwood City and Downey, California



Micro-Torc*— National's "break-through" in leather seals

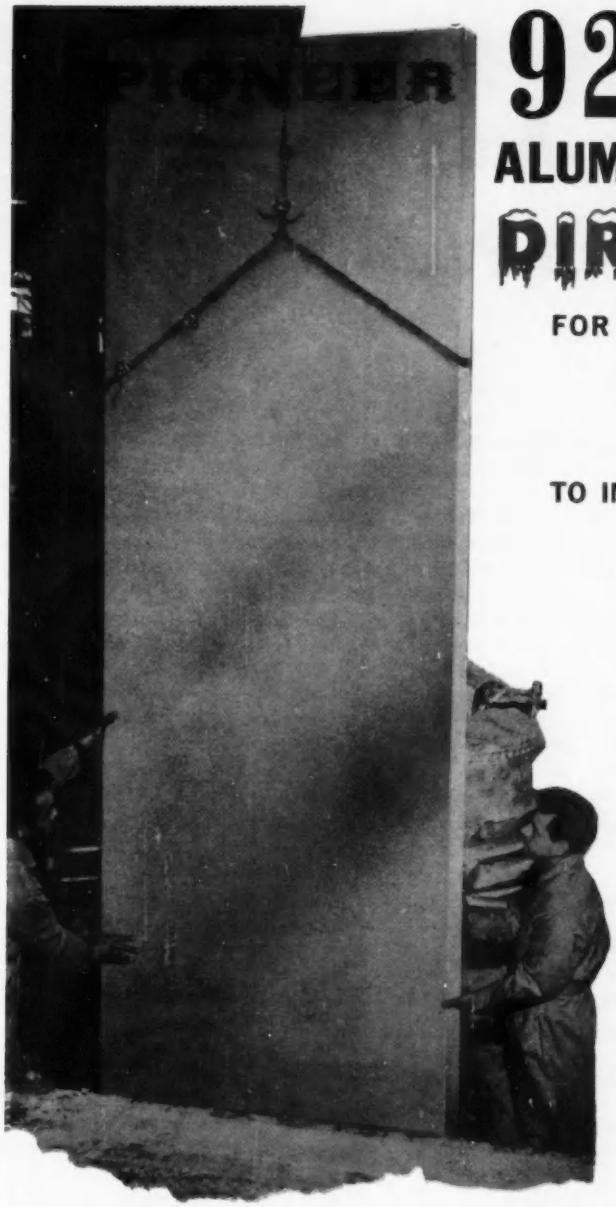
Micro-Torc Oil Seals, developed by and made only by National, have established new performance standards for leather seals. They absorb less power, run cooler and last longer than any leather seal made. Properly employed, they have *no measurable leakage* throughout service life.

Micro-Torc Oil Seals are produced by *coating*—not impregnating—chrome retanned leather with a dry lubricant in an elastomer binder. The result is a mechanically stable sealing member which does not leak oil *through* the leather, but does permit the unimpregnated central part of the leather to absorb oil for periods of momentary lubricant starvation.



See, feel the difference!

Micro-Torc sealing lips actually *look* and *feel* slicker, smoother — their cool-running, high-lubricity coating is plainly apparent to the touch. Ask your National Seal engineer to let you *feel the difference!*



921-T-*DC*

ALUMINUM TOOLING PLATE

DIRECT CHILLED

FOR *Greater Density, Less Porosity and Improved Stability*

TO INSURE:

1. EASIER MACHINABILITY
2. PRECISE DIMENSIONS
3. SUPERIOR FLATNESS
4. BETTER SURFACE FINISH
5. LOWER COST TOOLING

These five outstanding advantages are possible because, starting with a finer grain structure and an inherent stability not approached in any other lightweight tooling material, each 921-T-*DC* tooling plate is machine finished to exact dimensions before shipment.

Not only is 921-T-*DC* being used by leading airframe, automobile, appliance and other metal working industries for jigs, fixtures and production tools, but is finding acceptance for use in the manufacture of precision equipment and components where close tolerances, uniformity and stability are prime requirements.

GET THE FULL STORY

• • • A complete description of Pioneer 921-T-DC; its versatility and adaptability; illustrations of applications, are contained in a new brochure available without cost or obligation through any of the Pioneer distributors listed below.



SPECIFY PIONEER 921-T AND ORDER FROM THESE METAL SUPPLIERS

PIONEER ALUMINUM INC.

Subsidiary of Morris P. Kirk & Son, Inc.
Pacific Coast Unit of National Lead Company

5251 W. Imperial Hwy., Los Angeles 45, Calif.
Phone: ORegon 8-5073

EASTERN SALES OFFICE
288 Old Country Road, Mineola, New York
Phone: Pioneer 7-6171

MIDWEST SALES OFFICE
23439 Michigan Ave., Dearborn, Mich.
Phone: LOgan 3-2708

SOUTHWEST SALES OFFICE
P. O. Box 702, Dallas, Texas
Phone: EMerson 1-2971

ALBUQUERQUE, N.M.: Morris Steel & Supply Co.
ATLANTA, GA.: Reynolds Aluminum Supply Co.
BOSTON, MASS.: American Steel & Aluminum Corp.
Joseph T. Ryerson & Son, Inc.
BIRMINGHAM, ALA.: Reynolds Aluminum Supply Co.
BUFFALO, N.Y.: Joseph T. Ryerson & Son, Inc.
CHICAGO, ILL.: Joseph T. Ryerson & Son, Inc.
Kaole Steel and Aluminum
CLEVELAND, O.: Kaole Steel & Aluminum
DALLAS, TEX.: Vinson Steel & Aluminum Co.
DEARBORN, MICH.: Pioneer Aluminum Inc.
DENVER, COLO.: ABC Metals Corporation
DETROIT, MICH.: Kaole Steel & Aluminum
Meier Brass and Aluminum Co.
FT. LAUDERDALE, FLA.: Caulley Steel and Supply Co.
GRAND RAPIDS, MICH.: Kaole Steel & Aluminum
HARTFORD, CONN.: American Steel & Aluminum Corp.
HILLSIDE, N.J.: Edgcomb Steel & Aluminum Corp.
HOUSTON, TEX.: Vinson Steel and Aluminum Co.
JERSEY CITY, N.J.: Joseph T. Ryerson & Son, Inc.
KANSAS CITY, MO.: Industrial Metals, Inc.
LOS ANGELES, CALIF.: Braico Metals Co., Inc.
Continental Metals Co., Inc.
Earle M. Jorgensen Co.
Tool Components, Inc.
LOUISVILLE, KY.: Reynolds Aluminum Supply Co.
MEMPHIS, TENN.: Reynolds Aluminum Supply Co.
MIAMI, FLA.: Reynolds Aluminum Supply Co.
Caulley Steel and Supply Company
MILWAUKEE, WIS.: Joseph T. Ryerson & Son, Inc.
MINEOLA, N.Y.: Pioneer Aluminum Inc.
NASHVILLE, TENN.: Reynolds Aluminum Supply Co.
OAKLAND, CALIF.: Earle M. Jorgenson Co.
ORLANDO, FLA.: Caulley Steel and Supply Company
RALEIGH, N.C.: Reynolds Aluminum Supply Co.
RICHMOND, VA.: Reynolds Aluminum Supply Co.
SAVANNAH, GA.: Reynolds Aluminum Supply Co.
ST. LOUIS, MO.: Industrial Metals, Inc.
Joseph T. Ryerson & Son, Inc.
SOUTH BEND, IND.: Kaole Steel & Aluminum
TULSA, OKLA.: Industrial Metals, Inc.
UNION, N.J.: Mapes & Sprowl Steel Co.
WALLINGFORD, CONN.: Joseph T. Ryerson & Son, Inc.
WICHITA, KAN.: Industrial Metals, Inc.

SALES REPRESENTATIVES:
Morris P. Kirk & Son, Inc.
4050 Horton St., Emeryville 8, Calif.
Also: Fresno, Calif.; Phoenix, Ariz.; Salt Lake City
The Norwest Company
330 Second Ave. West, Seattle 99, Wash.

WORLD'S LARGEST DISTRIBUTOR OF AIRCRAFT EXTRUSIONS / MORE THAN 2,500,000 POUNDS IN OVER 7,000 SHAPES

Circle 137 on Inquiry Card for more data

Accelerated Missile To Pace '59 Aircraft

Two significant factors marked 1958 at its inception, according to a year-end statement issued by the Aircraft Industries Association. The year began in an atmosphere of national concern over Russia's displays of scientific and technological progress. This was coupled with a reduced defense industrial capacity, due to declining Government expenditures during 1957. In order to cut defense spending, many contracts had been cancelled, programs had been stretched out, progress payments cut, and employment reduced.

1958 Achievements

The aircraft and missile industry during 1958 delivered hardware that placed five satellites in orbit. Both IRBM and ICBM ballistic missiles were tested and put into limited production. Nearly every company in the industry is active in one part or another of the guided missile program, holding about 80 per cent of the prime contracts for the major missile components.

More than 40 missile projects had been announced by the military services by year-end 1958. These projects by operational category include: Surface-to-surface, 20; surface-to-underwater, 3; air-to-air, 6; surface-to-air, 9; air-to-surface, 6; diversionary, 2. In addition, there were about 20 test vehicles, drones, targets and surveillance vehicles.

The nation's airline industry moved into the jet age with delivery of turbine-powered airliners to both domestic and international carriers. About 10 other new aircraft models went into production during the year.

On the futuristic side, an experimental rocket plane, designed to accelerate to speeds in excess of 3600 mph in 90 seconds, was rolled out late in the year. The Air Force awarded a contract for a trisonic bomber to fly at speeds of over 2000 mph at an altitude above 70,000 ft.

An Air Force production fighter captured both world speed and altitude records, traveling at 1404.09 mph, and climbing to an altitude of 91,243 ft. A U. S. jet tanker transport chalked up a number of records, including a new non-stop distance record of 10,229.3 miles without refueling. Smaller craft set official endurance and non-stop records.

Employment, Costs

Employment in the aircraft industry continued to decrease for the first five months of 1958, but has increased slightly since then. At the end of September, it stood at 760,900 persons and is expected to remain at about this level into the first months of 1959.

Inflation is a major factor in the high cost of aircraft and missile production. At the same time, weapons systems are becoming more expensive as their performance requirements increase.

Average hourly wages of aircraft industry employees are also a major factor. They continued to increase during 1958, climbing from a 1957 annual average of $2.36 to $2.55 in September, 1958. Corresponding average weekly wages have increased from the 1957 annual average of $96.76 to $103.79 in September, 1958.

Sales, Production

Sales of the aircraft and missile industry for 1958 are estimated at $11.8 billion, approximately the same as in 1957.

Despite the high sales, production of military aircraft declined from an estimated 5500 units in 1957 to about 4000 units in 1958. However, rising expenditures for missiles and space vehicles partially offset this marked decline. Expenditures for the procurement and production of missiles have risen about 60 per cent from fiscal year 1957 to the estimate for fiscal year 1959.

Commercial sales declined for the first three quarters of 1958 as piston-powered airliners were phased out of production. They were estimated to increase in the fourth quarter as the first of the turbine-powered airliners were delivered. Commercial aircraft, engines, propellers and parts sales are estimated at about $1.5 billion

---

Three Aircraft Firms Form L.I. Space Projects Team

Three major aircraft companies have agreed to pool their talents and facilities on new missiles and space projects.

In a joint statement, the three companies—Grumman Aircraft Engineering Corp., Republic Aviation Corp., and Fairchild Engine and Airplane Corp.—said that the venture "will not interfere with programs being carried out individually by each company in the aircraft and other fields."

Purpose of the joint effort, the announcement said, was to project the three Long Island companies "more strongly into new missile and space programs."

The new program will be guided by a Space Projects Coordinating Committee made up of two representatives from each company.

Named to the Committee are: Grumman: Oscar Erlandsen, director

and Space Programs Industry Activity

in 1958, compared to $1.6 billion in 1957.

Total commercial aircraft production, including helicopters, for 1958 is estimated at 6780 units, slightly higher than the 1957 output of 6745 units. The value of the 1958 civil aircraft production is estimated to be about the same in 1957.

About 225 transports were delivered in 1958, compared to 322 units in 1957. More than 50 of these planes were turbine-powered transports. At the end of October, U. S. manufacturers had orders for more than 600 turbine transports, valued at about $3 billion.

Utility aircraft production was higher in 1958 than in 1957. About 6300 utility airplanes were delivered in 1958, compared to 6118 in 1957. The value of these shipments was approximately the same as in 1957, about $100 million.

Earnings vs. Sales

SALES of the 12 major airframe manufacturers in 1958 were about $7.0 billion compared to $6.9 billion in 1957. Earnings, however, continued to decrease. The average net profit, as a percentage of sales of the 12 companies, has decreased steadily since 1954—from 3.7 per cent, to 2.4 per cent in 1957. Earnings of the group were $105.8 million for the first nine months of 1958, compared to $120.1 million for the same period in 1957.

Backlog of Orders

THE backlog of the aircraft companies is steadily decreasing. It has declined $1.4 billion since the first of the year. As of Sept. 30, 1958, aircraft companies had orders on their books for $13.1 billion, compared to $14.5 billion on Dec. 31, 1957. The backlog has declined more than $5 billion since Sept. 30, 1956.

Reduction in military aircraft backlog accounts for about $1 billion of the 1958 decrease, and about $4 billion of the $5 billion decrease during the last two years. While it is not possible to calculate the exact increase in the missile backlog, it does not appear to equal the reduction in the aircraft backlog.

The commercial backlog has remained fairly constant for the past year as deliveries of the turbine-powered airline transports started late in the year. On the other hand, the backlog of orders for piston - powered transports has dropped substantially.

Prospects for 1959

AN exact forecast of the 1959 level of activity in the aircraft industry is not possible because it is geared to the expenditure policies of the Defense Dept. Military products continue to represent more than 80 per cent of the sales of the aircraft companies.

Barring a national emergency, expenditures for aircraft and missiles combined are estimated to be about the same as in 1958. Missile spending will increase, and aircraft spending will decrease. Production of military aircraft will continue to decline. The ICBM and space programs will be accelerated.

It is anticipated that sales for 1959 will continue to be high, running well over $10 billion. In addition to increased missile and space vehicle sales, deliveries of turbine-powered commercial transports will rise. A high market for business and utility aircraft will continue.

Research and development expenditures will increase and represent a large percentage of aircraft industry contracts; lengthy production runs have ceased. This trend will seriously affect the rate of earnings of the aircraft industry. The fees that the industry has received for R & D contracts are low; procurement procedures seriously affect earnings. Ratio of earnings to sales will not increase.

The industry will continue to reinvest a large percentage of its earnings in facilities. In the 10 years following the end of World War II, the aircraft industry invested $1 billion of its earnings in research and development programs and facilities for aircraft and missiles. By 1961, at the present rate, it will have invested in excess of another $1 billion. ■

---

of missile development, and James Starr, coordinator of missiles and aeronautics; Republic: Dr. William O'Donnell, chief research and development engineer, and Louis Helmuth, assistant sales manager; Fairchild: Grayson Merrill, general manager of Astrionics Div., and A. W. Doherty, contracts manager.

North American Gets AF Award To Produce GAM-77 Missiles

The Air Force awarded an $18,928,000 contract to North American Aviation's Missile Division for production of the GAM-77 air-to-surface missile.

This is the first missile GAM-77 production contract to be awarded the division, North American said. Production quantities were not disclosed.

The GAM-77, which has a range of several hundred miles, will get its first tryout with the B-52G "missile platform" bomber, now in production for the SAC at Boeing's Wichita plant.

INDUSTRY





REVIEWS *and* PREVIEWS

- Steel
- Stainless Steel
- Aluminum
- Copper
- Nickel
- Zinc
- Magnesium
- Metallurgy
- Rubber
- Petroleum
- Plastics
- Road Building
- Material Handling
- Construction

STEEL THE uptrend in iron and steel production will continue during 1959, according to Max D. Howell, executive vice-president of American Iron and Steel Institute. The new year's output of ingots and steel for castings will be 100 to 110 million net tons, barring unforeseen interruptions, he said. This would compare with about 85 million tons during 1958 and 117 million tons in the record year 1955.

In recent months, the output has come a long way up the recovery road. Monthly production was 55 per cent higher in the month of November, as compared to the low point last April. About nine million tons more steel was made in the last half of 1958 than in the initial six months of the year.

William S. Story, Director of Public Relations, Institute of Scrap Iron & Steel, points out in a similar year-end statement that the automotive industry merits first consideration in assessing the improvement in steel-consuming industries and its effect on steel demand. In a normal year, he said, shipments of finished steel products to automotive manufacturers will account for about 18 to 20 per cent of total shipments.

During the first nine months of 1958, shipments of finished steel were about 16 per cent, the lowest level since 1947. The steel industry is encouraged by the fact that automotive companies have recently come into the market with increased demand for steel.

Demand for cold rolled sheets, a prime automotive grade, has stepped up measurably. Orders for manufacturer's wire, another item used in car production, has also increased. Steelmakers fully expect the automobile industry to produce at least its forecast 5.5 million passenger cars in 1959, or even more.

The net earnings of the iron and steel industry were only slightly higher in the third quarter of 1958, despite the rising rate of operations, Mr. Howell continued in his review. They were up two per cent, as compared to the second quarter of 1958, and down 26 per cent as compared to the third quarter of 1957. In the first nine months of 1958, the profits were 44 per cent below the total for the corresponding period of 1957. These figures are reported to AISI by companies representing around 93 per cent of total steel output.

Recent increases in the amount of iron and steel products being imported into the United States have been the cause of considerable concern, especially in the Seaboard areas. The excess of total exports over imports has steadily decreased, and the advantage has virtually disappeared in the case of certain individual products.

Undaunted by the somewhat lower production rates, iron and steel companies have gone ahead with a wide variety of capital improvement programs. They are better equipped than ever before. Among the principal new projects are rolling mills of various types and sizes, sintering plants, continuous annealing lines, research centers, another new oxygen steelmaking plant, as well as many other facilities.

Steelmaking capacities have also been increased As a result, the national steelmaking potential probably stands now at a record high annual level



(perhaps as much as 145-150 million tons).

Although steel production declined 25 per cent in 1958, as compared to 1957, the estimated average hourly payroll cost for wage earners in the iron and steel industry increased about 10 per cent during the same interval. Employment cost per hour worked by production and maintenance employes rose from $3.216 in 1957 to $3.471 during the first half of 1958, and about $3.60 during the second half of 1958. Included in these costs are company contributions to pensions, insurance, social security, and supplemental unemployment benefits, which are now more than six times as high as they were in 1949.

The estimated 1958 payroll (wage and salary employes) of companies reporting to American Iron and Steel Institute was over $3.3 billion, as compared to $3.8 billion during 1957. This is a decline of about 13 per cent, against the drop of 25 per cent in steel production between 1957 and 1958. Estimated average employment during 1958 was 522,000 persons.

The iron and steel industry's technological progress went forward at a rapid rate during 1958. Developments included: the growing use of self-fluxing sinter in blast furnaces; utilization of the vacuum casting process for quality steels; improved methods of beneficiating iron ores; progress in direct reduction processes; increases in the output of steel by the oxygen process; the development of design information for steel structures; improvement of coking coal quality, and growth of continuous annealing of tin plate. Iron ore explorations were widened and new ore sources developed.

STAINLESS STEEL

THE lower volume of passenger car production in 1958 was reflected in shipments of stainless steel for automotive applications. Stainless shipments to automotive manufacturers and independent suppliers for use in automobiles built during the 1958 calendar year were estimated to be slightly above 72,000 tons. This total was compared to shipments of over 106,000 tons in 1957 by the Committee of Stainless Steel Producers of the American Iron and Steel Institute.

Preliminary fourth quarter figures indicate stainless has emerged from the recession with solid reasons to predict a 1959 output that will exceed 1958 tonnage by a healthy margin. Industry estimates indicate that 1959 shipments should closely approach, if not exceed, the better-than-average mark set in 1957.

During the first three quarters of 1958, stainless steel production was 25 per cent off the pace set in the first nine months of 1957. In comparison, overall steel tonnage in the same 1958 period declined 33 per cent from 1957 figures through the third quarter of the year.

One key element in the optimistic outlook for stainless is the greater usage of the metal for both decorative and functional purposes in the new cars. This subject is discussed more fully in an article entitled "Increased Use of Stainless Steel Brightwork on 1959 Automobiles" found elsewhere in this issue.

Aside from the fact that brightwork continues to be predominantly stainless, there is a good likelihood that come future models will have bumpers of stainless. These factors, coupled with expected improvements in the automotive production and sales picture, indicate that substantial gains should be realized in stainless shipments to this important market during the coming year.

Stainless is also being examined for use in structural members which can "double" as decorative trim, as well as in lifetime mufflers and valve coatings. Improvements in brake systems may be effected by such techniques as spraying a coating of stainless steel wire on aluminum brake drums to provide the friction surface. The process, which would eliminate the costly foundry procedure of using cast iron inserts, would consume about five lb of wire per car.

Increasing demands for higher quality in a range of products from chemical processing equipment to kitchen appliances point toward increased use of stainless in 1959 and beyond. Producers also look to this period as one of steady expansion of such recently tapped markets as the atomic energy, aircraft and missile fields. Few reasons exist in the eyes of the members of the Committee of Stainless Steel Producers for modifying earlier predictions of a doubling of stainless output by 1967.

(Continued on next page)

ALUMINUM

NEW facilities which opened in the U. S. during 1958 carried America's aluminum production capacity beyond the two million ton mark, according to a year-end statement by Donald M. White, executive secretary of the Aluminum Association. Primary aluminum installed capacity at the beginning of the year stood at 1,841,750 tons. Present plans call for a total capacity of over 2.6 million tons of primary aluminum by 1960.

Two newcomers joined the ranks of aluminum producers in 1958 to add a potential combined capacity of 234,000 tons. These two new producers were Ormet Corp. (with a capacity of 180,000 tons), jointly owned by Olin Mathieson Chemical Corp. and Revere Copper & Brass, Inc., and Harvey Aluminum (with a capacity of 54,000 tons).

Capacity for producing semi-fabricated aluminum has also been expanded during 1958, and additional facilities will be installed during 1959. New items of equipment of special note during the year were: the start-up of Kaiser's hot-line at Ravenswood, West Va.; the installation of two 16 million lb plate stretchers (one by Alcoa and one by Reynolds); and the installation by Reynolds of a 6000-ton extrusion press, owned by the U. S. Navy, in its Phoenix, Ariz., plant.

The major additional facilities to come in during 1959 are: the new rolling mill of Olin Mathieson at Hannibal, O., scheduled for full operation in 1959; Kaiser's 30 million lb plate stretcher at Ravenswood; and Alcoa's 14,000-ton press at its Lafayette, Ind., plant. In addition, other small presses are scheduled to be installed by other companies.

Actual aluminum production in 1958 ranged somewhat behind the industry's ability to turn out the metal. The recession, which became apparent during the last quarter of 1957, continued to mid-1958 and resulted in curtailed output during that period. Reopening of idle facilities has gained momentum since July, and production for 1958 totaled about 1.55 million tons, or about six per cent below 1957.

In April, aluminum pig price dropped from 26¢ to 24¢ per pound following the growing importation of low-priced Russian aluminum in the United Kingdom. This action made it clear that Iron Curtain countries could use basic commodities as weapons to weaken Free World economy. Pig and ingot prices advanced from 24.0 to 24.7 cents a pound in August as a result of higher costs.

Even in the teeth of the recession, there was general optimism among industry spokesmen. The tremendous production potential was itself reassuring, and some predictions suggested that consumption would be more than double present productive capacity by 1965 and five times present capacity by 1975.

The automotive market remains one of the most promising growth fields for aluminum. A significant indication of this fact was the announcement that one automobile manufacturer had three experimental engines in development. Such an engine would add about 130 lb of aluminum to an average of about 47 lb per car in the 1958 models. This average was originally estimated by Alcoa to be about 52 lb per car (see AI, Jan. 15, 1958) but was revised downward on the basis of later information.

Automotive applications of aluminum will again register a gain in 1959 with an estimated average use of about 51 lb per car for a gain of about 8.5 per cent over the 1958 figure. Since domestic production of cars is expected to be up 30 per cent over 1958, this would indicate a similar percentage increase in aluminum consumption in this one major field.

The demand for extremely lightweight components in fabrication of missiles and space vehicles has created and will continue to assure a ready market for all basic forms of aluminum, including ultra-fine particles for propellant mixtures. The growing production of missiles in 1959 will take increased tonnages of aluminum.

In addition, there were new orders in 1958 for large commercial jet aircraft, particularly the Boeing 707, the Douglas DC-8, and Convair 880. The Aluminum Association advanced a new three-digit system for identifying stress-relieved tempers which is particularly applicable to the unusually large wrought aluminum parts used in airframe construction.

The physical volume of construction is expected to be higher in 1959, and more aluminum is expected to be used per unit for construction. Appliances and other consumer durable goods are expected to be produced at a higher rate in 1959 and will use more aluminum, and similarly with various types of machinery and equipment. An increased amount of aluminum will be used in containers and packaging.

Aluminum used for steel deoxidizing and for alloying with other metals should increase in line with the anticipated increased production of steel and these other non-aluminum base alloys.

In addition to the increased amounts of aluminum expected to be used in the production of end-products in 1959, a significant increase in inventories of manufacturing plants is anticipated. These inventories, now at a low level, will be brought up to more adequate working levels.

The increased availability of aluminum in 1959 and the construction of new producing facilities for the future promise ample supplies for consumers. An extensive advertising and promotion campaign by the industry and continued research and development should stimulate the growth of old uses and the development of new uses. In summary, the outlook for the aluminum industry in 1959 is for a substantial improvement, amounting to about 20 per cent and possibly more, over 1958.

(*Turn to page 59, please*)

Computer Expedites Engineering Developments at Schwitzer Corp.

By Joseph Geschelin

ABOUT three years ago Schwitzer Corp., Indianapolis, Ind., installed a Remington Rand Univac 60 Digital Computer to expedite management and operating reports. The equipment was used for computing factory payrolls, general account reports, sales, budget, cost analysis, material control reports, and others.

The company, as is well known, is an important producer of turbochargers, superchargers, torsional vibration dampers, fans and fan drives. Since the development and specific applications of these products require a great deal of mathematical analysis, the company decided that engineering calculations would be added to the duty of the computer. According to Schwitzer, they may be one of the first of the parts makers to employ card programming of engineering calculations on a small computer.

With the assistance of a Remington Rand Methods Engineer, two programs were worked out by Schwitzer to solve engineering equations. The first utilized the "educated estimate" and was called the "Bridge." The "Bridge" was programmed to use the "estimate" and calculate the problem in a rough manner, then decrease or increase estimated frequency (Omega) dependent on whether the answer was positive or negative. The Computer was wired to stop when it arrived at an answer within ± 0.009. This method refined the original guess to a "rough" figure.

A second set of panels completed the calculation by further refining the "rough" figure. Total time to print answers, after computing, amounted to about one hour.

Turbocharger analysis required equations that were more complex. Card Programming was used to break down the functions of the equation into simple arithmetic steps.

In this manner, sub-routines were used, including logarithmic and exponential equations.

Not only were the possibilities of human error eliminated and substantial time saved but engineering personnel were freed from duties as "Calculators" to exert their greatest efforts in creative work.

TURBOCHARGERS and SUPERCHARGERS

Turbochargers and superchargers involve highly specialized manufacturing techniques and extremely critical testing methods.

They are run through their paces in test-cells, the varying conditions under which each assembly must operate being carefully duplicated in the Engineering Laboratory. Analysis of test results requires complex and tedious calculations.

Data from the test runs are entered on printed forms. Normally, there are from six to nine test data sheets on each speed at which the assembly is tested. Using a desk calculator, about 45 minutes are required to compute each of these test sheets or a total of four to six hours for the group.

Tests are run at five different speeds and require from 15 to 20 man hours to compute via the manual method. The computer reduces this to but a fraction of the manual computation time.

The torsional vibration crankshaft damper requires a multitude of calculations to complete the proper designs. An analysis is made prior to the design of the damper for each new engine installation. The non-bonded damper, designed and developed by Schwitzer, consists of three members: a hub; a rubber or elastic member; and an inertia member. This assembly functions on the engine as a "tuned" friction type, torsional vibration absorber.

In making calculations on torsional vibration dampers, the natural frequency of the engine must first be obtained. This is accomplished by using the Holzer tabulation method. In this method the natural frequency is first assumed based upon prior experience and familiarity with the variables that exist. If this assumption is correct the summation of torque in the Holzer tabulation will be zero. If incorrect, the entire process must be repeated. The number and complexity of the calculations involved with this method make human errors frequent. This complicates a process which in essence is the successive elimination of errors in estimates.

By the use of the Univac the possibility of human error in calculation is reduced. By using the card programming program to successively estimate values, the correct frequency values can be found quickly and efficiently. This saves much valuable engineering time which can then be utilized on other research and design work. ■

Readers of
AUTOMOTIVE INDUSTRIES
are always well informed

Average 1959 Automobile Uses 51.58

THE average 1959 passenger car utilizes over 51 lb of aluminum to surpass all previous records, according to Aluminum Co. of America. Based on predictions for a 1959 model production of 5.5 million cars, total automobile industry consumption of aluminum should rise to more than 283 million lb this year.

This increase in the poundage of aluminum used for automotive applications was revealed in the fourth annual Alcoa survey report presented at the SAE Annual Meeting in Detroit. The exact figure of 51.58 lb of aluminum per average 1959 car was disclosed by F. J. Close, company vice-president in charge of sales development and commercial research. It represents net or finished part weights and does *not* include scrap.

Aluminum usage in the average passenger car has shown a steady upward trend in recent years, despite the 1958 recession. Total weight of aluminum sold to the automobile industry during the past five years exceeds one billion lb. The per-car average has risen from 29.6 lb in 1955 to 35.2, 40.5, 47.3 (revised) in 1956, 1957, and 1958, respectively, to the estimated 51.6 lb in 1959.

Alcoa had originally estimated a higher figure of 52.4 lb of aluminum per car for last year's models, based on a predicted 1958 model output of 5.5 million units. However, production of all cars, including an especially high percentage of models utilizing large quantities of aluminum, fell short of the total forecast. Thus, the first estimate was revised downward to 47.3 lb per car. Data compiled by the Alcoa Commercial Research Div. on per-car usage of aluminum represent a weighted average arrived at by including in the calculations estimated proportions of total production for individual automobile makes.

Aluminum's role as a hardware and trim metal has become a major factor in today's automotive styling. Even in a relatively poor year, aluminum trim uses increased appreciably in 1958 to 8.98 lb

APPLICATION OF ALUMINUM (BY CAR) ON AN ESTIMATED 1959 MODEL OUTPUT OF 5,500,000 UNITS

(Based on Actual 1958 Model Percentages)

Car	Estimated Production (Cars)	Estimated Production (Per Cent of Total)	Average Car* Estimated Production (Cars)	Average Car* Aluminum Usage (Pounds)	Automatic Transmission Estimated Production (Cars)	Automatic Transmission Aluminum Usage (Pounds)	Automatic Transmission, Power Brakes, Power Steering Estimated Production (Cars)	Automatic Transmission, Power Brakes, Power Steering Aluminum Usage (Pounds)	Composite Total (Pounds per Car)
Total General Motors	2,764,300	50.26	524,816	21.59	956,779	36.49	1,282,705	55.17	42.33
Chevrolet 6	608,850	11.07	426,195	20.52	121,770	22.02	60,885	25.07	21.27
Chevrolet 8	1,014,750	18.45	81,180	24.35	608,850	30.59	324,720	33.64	31.07
Pontiac	282,700	5.14	8,481	27.02	90,464	47.33	183,755	50.68	48.90
Buick	314,600	5.72	4,719	47.76	97,526	73.78	212,355	75.93	74.84
Oldsmobile	385,550	7.01	4,241	35.79	38,169	55.73	343,140	60.11	59.41
Cadillac	157,850	2.87	.....	....	.....	....	157,850	77.65	77.65
Total Ford	1,577,400	28.68	402,078	36.07	872,586	67.12	302,736	71.39	60.03
Ford 6	192,635	3.50	57,791	30.67	112,886	63.99	21,961	67.76	54.42
Ford 8	1,091,612	19.85	327,484	37.22	639,684	69.02	124,444	72.79	59.91
Edsel	81,400	1.48	8,140	36.15	35,816	59.26	37,444	63.23	58.78
Mercury	173,250	3.15	8,663	40.21	84,200	60.27	80,387	64.24	61.11
Lincoln	38,500	0.70	.....	....	.....	....	38,500	91.81	91.81
Total Chrysler	867,350	15.77	116,953	33.17	342,597	68.95	407,800	79.13	68.92
Plymouth 6	114,224	2.08	24,444	28.53	55,513	62.46	34,267	66.84	56.51
Plymouth 8	404,976	7.36	86,665	34.63	196,818	68.56	121,493	72.94	62.61
Dodge	180,850	3.29	5,429	29.82	71,475	71.41	104,046	75.87	72.72
De Soto	67,100	1.22	336	46.16	11,742	82.25	55,022	86.63	85.66
Chrysler	79,200	1.44	79	47.99	7,049	84.08	72,072	88.46	88.03
Imperial	20,900	0.38	.....	....	.....	....	20,900	99.67	99.67
Total Amer. Motors	210,850	3.83	101,614	39.63	81,994	57.38	27,042	65.90	49.91
Rambler 6	181,100	3.29	99,638	39.36	76,450	56.77	5,072	58.57	47.24
Rambler 8	29,490	0.54	1,976	53.24	5,544	65.79	21,970	67.59	66.29
Total S.-P. Corp.	68,200	1.24	39,147	9.63	25,643	30.85	3,410	30.56	18.66
Total Checker	12,100	0.22	4,840	20.54	7,260	42.77	.....	....	33.88
GRAND TOTAL:	5,500,000	100.00	1,189,448	28.77	2,286,859	53.75	2,023,693	62.53	51.58

*NOTE: Average car refers to composite car body model with net (finished) aluminum weight distributed, but without automatic transmission, power brakes, or power steering.

SOURCE: Aluminum Company of America, Commercial Research Division.

COMPARISON—1959 vs. 1958 (Revised)

Average Car Usage of Aluminum*
(Pounds Per Car)

Car	1958 (Revised)	1959	Change (%)
Total General Motors Corp.	38.27	42.33	+10.6
Chevrolet	23.72	27.40	+15.5
Pontiac	41.17	48.90	+18.8
Oldsmobile	55.35	59.41	+ 7.3
Cadillac	85.79	77.65	- 9.5
Buick	68.43	74.84	+ 9.4
Total Ford Motor Co.	49.60	60.03	+21.0
Ford	46.13	59.09	+28.1
Edsel	54.80	58.78	+ 7.2
Mercury	63.48	61.11	- 3.7
Lincoln	91.83	91.81	no change
Total Chrysler Corp.	75.32	68.92	- 8.5
Plymouth	69.77	61.27	-12.2
Dodge	70.96	72.72	+ 2.5
De Soto	86.41	85.66	- 0.9
Chrysler	90.93	88.03	- 3.2
Imperial	109.54	99.67	- 9.0
Total S.-P. Corp.	20.76	18.66	-10.1
Studebaker	20.01	18.66	- 6.7
Packard	34.88	.....	(a)
Total American Motors Corp.	49.22	49.91	+ 1.4
Total Checker Motors Corp.	.....	33.88	(b)
Total (All Cars)	47.32	51.58	+ 9.0

*Average car refers to composite car body model with aluminum weight distributed. Weights are net or finished part weights; scrap is not included.

(a) The Packard is not being made in 1959.

(b) The Superba was not made in 1958.

Source: Commercial Research Division, Aluminum Company of America.

lb of Aluminum

per car. Alcoa estimates trim uses will jump 11.6 per cent to 10.02 lb per car in 1959. Pontiac leads the trim parade this year with a sparkling 119 per cent increase in use of aluminum for this purpose. Rambler now requires 17 lb of aluminum trim per car, a high in poundage and a 26 per cent increase over 1958.

Automatic transmission assemblies continue to constitute the largest single poundage application—an average of about 25 lb in 1959 models—for aluminum in passenger cars. The aluminum transmission of the new Ford contributes to a 28 per cent increase in usage of the metal by this make. Alcoa recently cast its 75,000th transmission case for Ford.

Total aluminum usage in passenger cars would far exceed the expected 1959 total of 283 million lb if replacement and auxiliary parts were included. Replacement parts will contribute an average of six lb of aluminum per car during its life. About two lb are used to deoxidize the steel for each automobile. Over one lb is employed as an alloying ingredient for zinc die castings. None of these applications is included in the 51.34 lb figure.

Chrysler Corp. still paces the industry in per-car average usage of aluminum at 68.92 lb, although an 8.4 per cent decline was recorded from the 1957 figure of 75.32 lb. The Imperial line as a whole leads all makes for 1959 in using 99.67 lb per car with the convertible model individual high scorer at 121.24 lb.

The slight decrease in aluminum consumption by Chrysler Corp. is more than offset by increases of 10.6 and 21.0 per cent by General Motors Corp. and Ford Motor Co., respectively. A newcomer on the automotive scene, the 1959 Checker Motors passenger car, uses an average of 33.88 lb. ■

INDUSTRY Reviews and Previews

(*Continued from page* 56)

COPPER COPPER'S future is as bright as the metal itself, according to T. E. Veltfort, managing director, Copper & Brass Research Association. The U. S. copper industry concluded 1958 on a high note of optimism with good expectations for 1959 and subsequent years.

Shipments of fabricated products by brass and wire mills were up sharply during the fourth quarter of the year, and customer inventories seemed generally at low levels. October brass mill shipments of 184 million lb made it the industry's best month since early in 1956, according to Mr. Veltfort.

During the first quarter of 1958, much pessimism prevailed. In the recent business recession the three largest consumers of brass mill products — building, automobiles, and electrical—experienced a substantial decline, and were very slow to recover.

By the middle of July, however, the copper market had started to firm perceptibly. Early in August there were real indications that the U. S. economy was coming out of the doldrums. The demand for copper swelled, and mining companies, which had cut back earlier, increased production substantially.

Added to the impetus given the copper market by the American economic recovery, supplies began to tighten as strikes hit major holding operations in Canada, Africa, and the U. S. The big surpluses of only a few months previously had largely been consumed.

The Free World has a conservatively estimated 50-year supply of the red metal at the current rate of consumption. Increased per-capita consumption through new uses will be offset by discoveries of new deposits, and by further development of presently known ore bodies.

Copper mine capacity in the area is currently over 3.7 million short tons per year. New or improved facilities already scheduled or underway will bring that figure to 4.2 million tons by 1962.

Copper is continuously expanding old markets and finding new ones. The 42 standard and hundreds of special-purpose alloys offer numerous combinations of electrical, physical, and chemical properties to meet today's rigid performance specifications and multi-function design requirements.

New production techniques for the copper metals also expand their usefulness. Larger and more complex extrusions are being made to closer tolerances. Finer grain structures for improved product appearance and reduced finishing costs have been developed. Copper foils as thin as 0.0005 in. for a host of new applications have been developed. Development work on impact extrusions in the copper metals, availability of longer length coils for improved customer automation, and new conveniences in brass mill products packaging are just a few other examples of progress being made in copper.

The automotive industry remains a primary one for copper. Chrysler Corp., for example, has disclosed that an average of 46.6 lb of copper and its alloys are used in its 1959 car line. American Motors Corp. cites an even higher figure of 56 lb per vehicle. The Ford station wagon embodies an estimated 37 lb of the copper metals, while the Willys Jeep Forward Control 170 uses a like amount. The GMC highway bus

(*Turn to page* 61, *please*)

Ultrasonic Welding for Automotive Uses

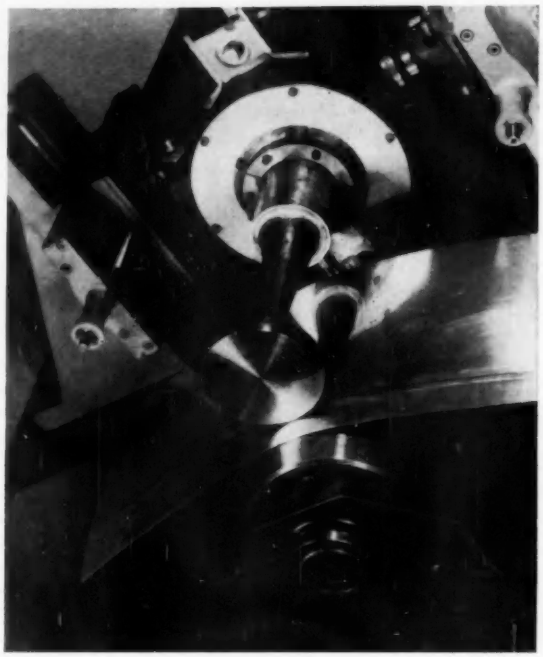


Fig. 2 — Closeup of Sonoweld continuous seam welder joining aluminum sheet. The upper roller is the active welding tip which delivers the ultrasonic energy.

RECENT equipment developments indicate automotive uses among a greatly-expanded potential for application of ultrasonic welding techniques.

When first introduced to the trade in 1956, the process was limited to fine parts and aluminum. By subsequent refinement of design, and employment of more power, the scope of materials and material thicknesses have now broadened considerably.

These latest developments in ultrasonic welding equipment were exhibited by Aeroprojects Inc. last month, during a three-day open house at West Chester, Pa. for industry and Government representatives.

New Equipment

Of particular interest, among the equipment displayed, was a Sonoweld spot-type unit with portable welding head (Fig. 1). Designed primarily for welding aluminum truck cabs and other vehicle bodies, it will weld 0.050 in. aluminum. Except for degreasing, no metal preparation is needed before the welding operation. The weld requires little, or no, finish operations. The portable head can be used at distances up to 150 ft from the generator. Power requirements are extremely low—4 kva.

A 4000-w Sonoweld spot welder that ups the thickness of material which can be handled by ultrasonic welding to levels never before attained was displayed. Thicknesses of aluminum to 0.090 in. can be handled in this connection in this machine.

Also shown was a new continuous-seam Sonoweld unit (Fig. 2) which produces uninterrupted and leak-tight welds in metal foils and light gage sheet materials — at rates up to 20 fpm.

Other new equipment developments included 100-w ultrasonic welding units devised for handling small, and delicate, instrument and electronic assembly operations.

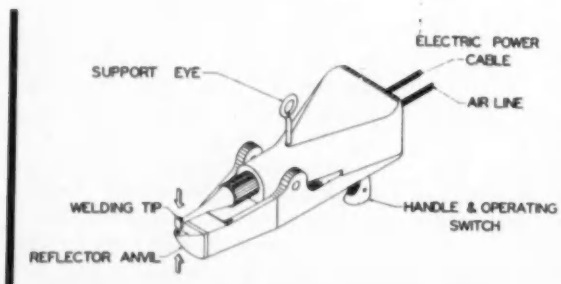


Fig. 1—Schematic of typical 2000-w portable welding head, which uses a lateral type of drive. Design variations can be made to suit the geometry of the weldment. Automatic timing and cycling are incorporated in the associated equipment.

Operating Principle

Welding by ultrasonics has been termed "solid state metallurgical bonding." The joining is not dependent upon heat and melting. It utilizes a shear-type high-intensity vibration imparted to the contacting surfaces of the workpiece as the bonding means.

The vibratory energy comes from a transducer (Fig. 3) which converts high-frequency alternating current (electrical) energy, from a generator, into high-frequency mechanical energy. The transducer consists of a winding and a core. The core is usually made of laminated stacks of thin-gage nickel sheet.

This component works by magnetostriction, i.e. on the principle that when stacked nickel is magnetized a small lengthening effect is produced. The intensity of the magnetic field changes with the flow through the winding of the alternating current supplied by the electronic generator. As the magnetic field intensity is changed thousands of times per second, the laminated nickel stack increases

TABLE I

Typical Ultrasonic Spot-Type Weld Strengths

Material	Thickness	Average Spot Strength*
302 Stainless Steel	0.025"	1040 ±40
17-7 PH (TH) Stainless Steel	0.020"	990 ±100
Molybdenum Powder Metallurgy	0.025"	430 ±50
Titanium 6 Al—4 V	0.040"	2260 ±180
Zircaloy 2	0.020"	620 ±30
Electrolytic Copper	0.042"	775 ±30
Brass 70-30	0.029"	540 ±30
1100 Aluminum	0.061"	680 ±30
2024-T3 Alclad Aluminum	0.090"	2080 ±100

* Average tensile-shear strength in pounds per ultrasonic spot-type weld, along with the 90 per cent confidence intervals, are shown above. Statistical techniques were used to interpret the data obtained.

These data have been obtained on Sonoweld equipment when welding two pieces of similar materials of the same thickness.

Source: Sonobond Corp., subsidiary of Aeroprojects Inc.

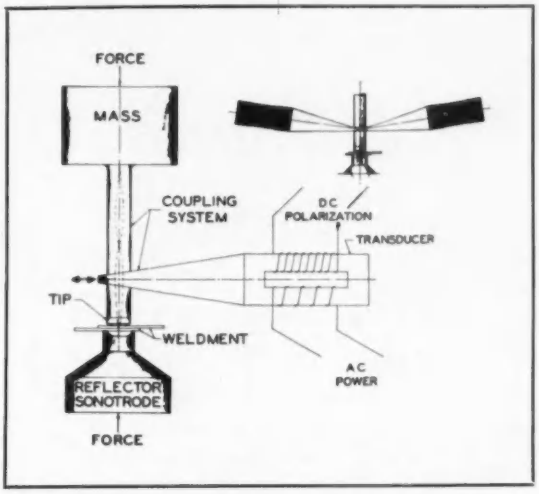


Fig. 3—Diagram of ultrasonic mass-reed-wedge transducer-coupling system. Single wedge system is used on 2000-w welders, while the double wedge system shown at upper right is used on 4000-w welders.

and decreases in length at the same rate.

The vibratory energy thus produced is transmitted to the work area through a transducer coupling system. Its frequency varies with the specific equipment and application. Most attention has been given to developing equipment operating in the range between 3000 and 85,000 cps. The 4000-w spot welder mentioned previously was said to operate at a frequency of 20,000 cps.

It is this rapid back and forth motion which causes the workpiece surfaces to interlace with each other molecularly.

Workpieces are clamped during the welding cycle, using pressures of as much as 1000 to 1200 lb. One of the problems has been to apply clamping forces of this magnitude—which are needed for the heavier material thicknesses—yet not significantly affect the resonant frequency of the tranducer-coupling system.

Strength of Welds

In tension shear strength, 2024-T3 Alclad aluminum alloy sheet has been welded in thicknesses up to 0.090 in. with single spot-type weld strengths exceeding Specification MIL-W-6860. On various other materials up to about 0.030 in. thick, there likewise has apparently been no difficulty in exceeding these specifications.

Table 1 shows the relative shear strengths of ultrasonic welds in various metals—in each case using two pieces of the same material. Use of the ultrasonic welding method also permits the joining of a wide variety of dissimilar metals. ■

INDUSTRY Reviews and Previews

●

(*Continued from page* 59)

contains an impressive 308 lb of copper and 260 lb of brass and bronze.

Overall average usage of copper and its alloys in 1959 automobiles is 40-42 lb per car. This average would include ordinary accessories such as radio and heater. The addition of an air conditioner could add as much as 30 lb to the total.

Copper in 1958 moved into the space age, whose vehicles are complexes of massive instrumentation using large quantities of the red metal. The Hercules Nike employs considerable copper in its electrical wiring system. Bronze filters are used throughout the hydraulic system, and bronze bearings are used because of their wear resistance.

The Atlas ICBM employs 180,000 ft of copper wire, and copper tubing is used in its hydraulic and pneumatic systems. Both the Atlas and the Thor IRBM are reported to use substantial amounts of copper in their nose cones for "heat sinks."

ZINC CONSUMPTION of slab zinc in the U. S. has resumed its long-established upward trend, according to zinc industry spokesmen. Prospects for healthy, long-range markets are favorable.

Galvanizing, which represents 40 per cent of the zinc market, continues as its leading consumer. Industrial and construction orders for galvanized products have risen so sharply that mills are reported hard pressed to meet fast delivery demands.

Most dramatic increase in the consumption of zinc for galvanizing is in steel sheet (see chart).

(*Turn to page* 62, *please*)

British Tractor Features Hydrostatic Drive

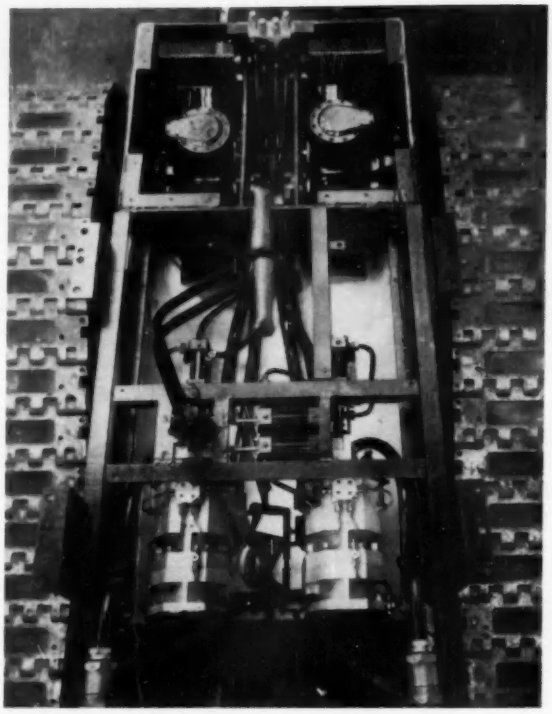
HYDROSTATIC transmission and an unusual method of track suspension are features of the Bagnall-Burns BB.90 crawler produced in Britain by W. G. Bagnall, Ltd. A Meadows 90-hp Diesel engine at the rear drives a pair of variable-delivery piston-type pumps whose swashplates are angled independently by two control levers. Oil from the pumps is piped to the separate hydraulic motors coupled to the forward sprockets. These are seven-cylinder radial units, similar to those described in A. I. of July 15, 1956, p. 53.

Tilt of the swashplate determines the rate and direction of oil flow to the motors, and hence regulates their speeds steplessly in both forward and reverse. When one lever is moved forward and the other back, the tracks run in opposite directions and the crawler turns on its axis.

Since the hydraulic system is of the positive-displacement type, the motors are locked when the swashplates are in the neutral or non-delivery position. Thus the two levers control braking as well as speed, direction and steering. The usual multi-ratio gearbox, differential, and steering clutches and brakes are thereby eliminated. Further ease of control is obtained by seating the driver sideways, enabling him to see both ends of the tractor and to watch towed or front-mounted implements.

Each track is carried by a pair of articulated bogies, the leading one pivoting on a triangular frame with an unsprung idler on top adjacent to the raised drive sprocket. As the bogie is deflected by rough terrain, the idler supporting the upper run moves to compensate automatically for variations in the effective length of the lower track, thereby providing maximum ground contact.

The eight-ton BB.90 has a rated drawbar pull of 15,000 lb, and speeds are infinitely variable from 0 to 7 mph in either direction. Hydraulic working pressure is 3000 psi, and the motors develop a maximum torque of 10,500 lb/ft. ■



Hydrostatic transmission of the BB.90 includes two piston-type pumps with swashplate angles controlled by individual levers, and a pair of radial hydraulic motors driving the front sprockets.

INDUSTRY Reviews and Previews

(*Continued from page* 61)

In 1948, for example, galvanized steel sheet shipments of 1.643 million tons were only 2.5 per cent of total steel shipments. By contrast, the 2,018,310 tons of galvanized sheet shipped during the first 10 months of 1958 represent an estimated 4.7 per cent of total steel shipments; this figure is expected to reach an annual total of four million tons by 1965.

SHIPMENTS OF GALVANIZED SHEET

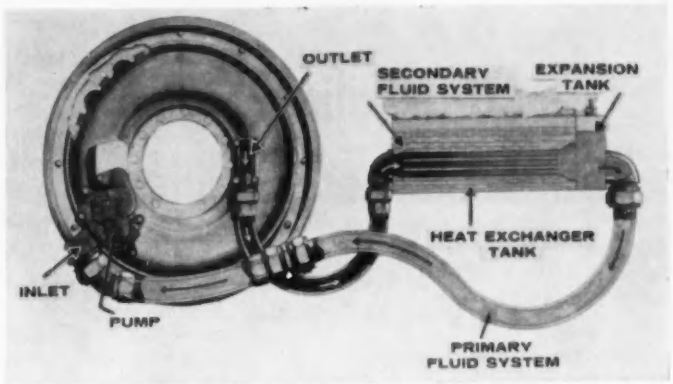
Year	Tons	Percentage of Total Steel Shipments
1948	1,643,000	2.5
1950	2,262,000	3.1
1952	1,961,000	2.9
1954	2,363,000	3.6
1955	2,864,000	3.4
1956	2,958,000	3.5
1957	2,393,000	3.0
1958 (10 mos.)	2,018,310	4.7

Highway programs scheduled to begin in 1959 are expected to reinforce the zinc market in consuming a substantial volume of the metal. It will be used in such applications as hot dip galvanizing of guard rails, culverts, bridges, tunnels, sign posts, and lighting systems.

The automobile industry continues to offer a fertile market for consumption of zinc die castings. American Zinc Institute reports that most 1959 cars, taken model by model, will carry more zinc than their 1958 counterparts; the aver-

(*Turn to page* 65, *please*)

Liquid-Cooled, Disk-Type Brake for High Performance Aircraft



B. F. Godrich fluid cooling system for aircraft brakes.

By Charles Weinert

NEW high-performance aircraft have emphasized the need for more capacity and faster dissipation of energy in the braking system.

One of the latest developments in this field is the brake system designed by B. F. Goodrich Aviation Products. It utilizes liquid-cooling in combination with disk-type brake units.

Flight and taxi tests of a prototype BFG installation were recently conducted on a Boeing 707-80 jet transport. They followed initial tests on the dynamometer, and taxi tests with a B-26.

The new brake system performed consistently and without fade. Stops were smooth and sure, with no chatter or squeal. Repeated landings and take-offs did not require brake cool-off time. Brake operating temperatures were "considerably less than 500 F."

Major features of the BFG brake is use of the liquid-cooling principle for rapid dissipation of heat from the friction elements. Up to 10 times faster heat dissipation, as compared to conventional brakes, is claimed.

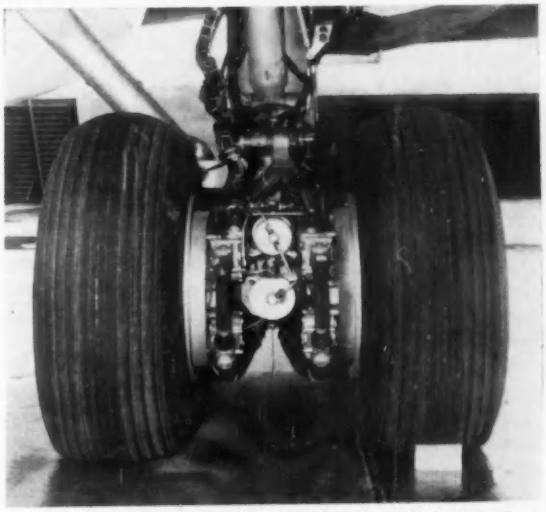
The fluid system is composed of two flow sections. In the primary section, a coolant such as glycol-water is circulated adjacent to the friction areas. The secondary section is a heat exchanger containing plain water.

Wheel-driven pumps circulate the primary fluid, which absorbs brake heat as it is generated and carries it to the heat exchanger where the heat is transferred to the water.

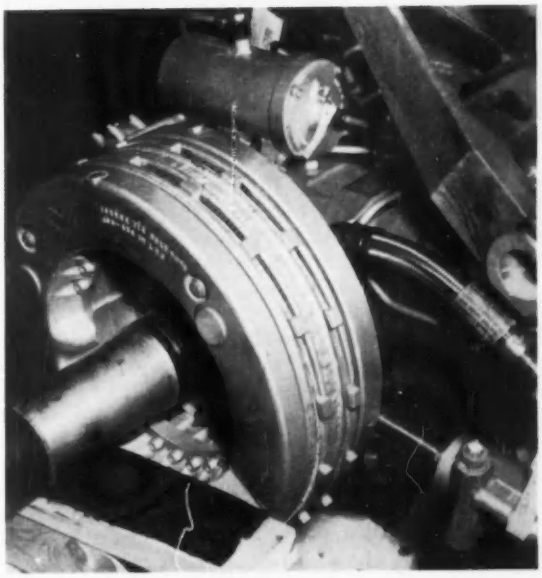
The expansion tank shown in the illustration is part of the primary section, serving as a variable volume for the expansion of the heated primary fluid.

Actuation of the brake is by cylinder operated from the aircraft hydraulic system. System pressure, however, is reduced to that required for the brake. A separate shuttle valve at the brake inlet provides for

(*Turn to page* 122, *please*)



Front view of BFG liquid-cooled-brake test installation. Cordon of wire was for instrumentation.



Close-up of single brake unit shows compact design. Primary cooling fluid circulates through each brake assembly and absorbs heat from the rear side of the friction plate.

Intercooling of Supercharged Engines

By A. D. Bogus
Young Radiator Co.

System Used	Manifold Pressure (PSIG)	Air Temperature From Turbocharger	Air Temperature To Inlet Manifold	Engine HP
Normally Aspirated	0	.....	90 F	1000
Buchi (Non-intercooled)	5–6	160 F	160 F	1500
Buchi (Intercooled)	5–6	160 F	100 F	1620
Miller (Intercooled)	15	250 F	100 F	2000
Miller (Intercooled)	30	365 F	100 F	2320

In general, the net output of any internal combustion engine using either the Diesel cycle or the Otto cycle is dependent on the relatively small difference between the work derived from the expansion minus the work necessary for compression. The amount of the net output, therefore, depends to a great extent on the efficiencies of compression and expansion. Only small increases in these efficiencies will greatly increase the output. This net output can also be increased by increasing the work derived from the expansion as the result of raising the temperature at the beginning of the expansion cycle. The greater the amount of air (in pounds per unit time) that is made to participate in the combustion process, the greater the output of the engine.

The best means thus far of economically increasing the amount of air to be used in the combustion process is to compound the reciprocating internal combustion engine with a turbocharger. The reciprocating engine handles the high pressure end of both compression and expansion, for which purpose it is capable of higher compression and expansion efficiencies. The turbocharger handles the low pressure end, where its comparatively lower compression and expansion efficiencies are high enough and where its large air flow handling ability results in the reduction of size and weight.

Air compressed by the turbocharger is raised in temperature in proportion to the compression pressure. It is the function of the air intercooler to lower the temperature of this compressed air to a point where the engine can take advantage of a greater weight of air per cubic foot of volume and thus enable more fuel to burn in the cylinder with a proportionate increase in engine horsepower.

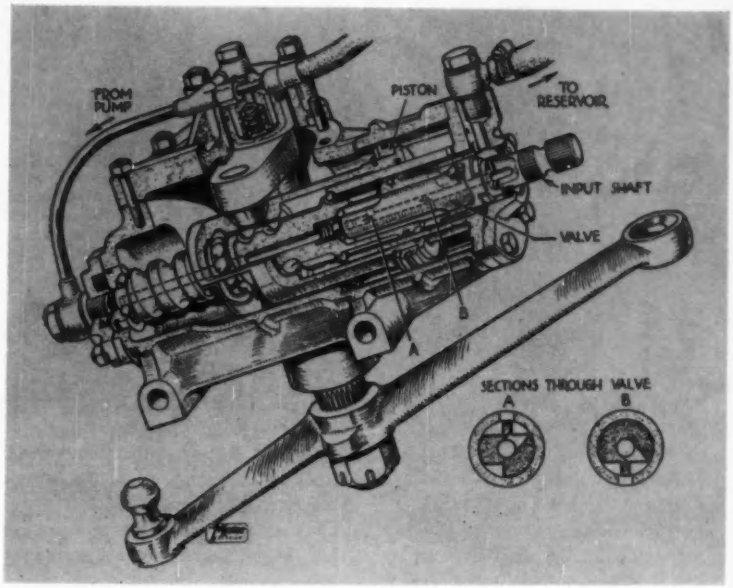
The first successful method of turbocharging engines was the Buchi system, which is now very well-known. In this system the air pressure to the inlet manifolds was in the neighborhood of 5 to 6 psig, the low pressure turbocharging range. Such a considerable increase in power was possible with this low pressure range that the use of normally aspirated engines, especially the large four stroke stationary engines, no longer became economically justified. In the Buchi system of turbocharging, the air was not intercooled yet the specific output of the engine was increased by 50 per cent over the output of a normally aspirated engine. Under these conditions the air temperature to the inlet manifold was approximately 160 F. This temperture of 160 F represents a temperature rise of 70 F due to adiabatic air compression by the turbocharger added to the DEMA base temperature of 90 F. If this air temperature were reduced to 100 F by intercooling, the power output of the engine would be increased to a value of approximately 62 per cent over the output of a normally aspirated engine.

Over a period of time the turbocharging pressures have been increased until now inlet manifold pressures are in the range of 15 to 30 psig. For the sake of an example, let us consider the Miller system of turbocharging with an inlet manifold pressure of 15 psig. At this pressure and with air intercooled to 100 F from its turbocharged temperature of 250 F, the power can be increased 100 per cent over that of a normally aspirated engine. Using this same Miller system but turbocharging the air to 30 psig, the air temperature now becomes 365 F considering the DEMA base temperature of 90 F. By intercooling this air and reducing the temperature to 100 F, the horsepower increase now becomes approximately 132 per cent over that of a normally aspirated engine. It can be seen from the above examples that the function of an air intercooler is a very important factor in the attainment of high specific horsepower outputs by the use of high pressure turbocharging. For every 10 F drop in air temperature to the cylinders, the horsepower of the engine is increased by approximately 3 per cent.

A summary of the characteristics for different turbocharging pressures, the air temperatures from the turbocharger, the air temperatures to the inlet manifold and the horsepower derived using a hypothetical rating of 1000 hp for a normally aspirated four cycle engine is given in the table.

The discussion thus far has dealt only with power increased for turbocharged four stroke engines, where the power to drive the turbocharger turbine is derived from exhaust gases. Two stroke engines

(*Turn to page* 120, *please*)



Sectional view of the Burman steering unit, showing the coaxial relationship of the cylinder, piston extending from the nut, valve bore in the worm shaft, and rotating valve coupled to the input shaft. Illustration courtesy of The Motor, England.

Design Details of
Burman Integral Power Steering

FITTED to the Jaguar Mark IX and Armstrong-Siddeley Star Sapphire introduced in October, the new British-built Burman power-assisted steering is entirely contained within the steering box without external rams or linkage. It operates on the worm-and-nut principle, and is only slightly larger than the manual unit from which it is derived.

The main housing is lengthened to accommodate the pressed-in cylinder, while the piston is a hollow extension of the nut that engages the rocker shaft and is positioned by the worm and recirculating balls. The rear end of the worm shaft is bored out to take the hydraulic selector valve which is connected to and rotated by the steering column.

Mechanical coupling between this input shaft and the worm consists of an interrupted flange on the end of the valve which gives a loose dog-type engagement with the worm. This provides a small amount of free radial movement of the valve which regulates the oil flow, yet permits direct steering in the event of hydraulic failure.

Oil from the external engine-driven pump enters the box at the center of the front cover and passes through a small axial drilling in the worm. When no turning effort is applied to the steering wheel, the oil flows through the valve and out to the reservoir. Under these conditions the valve is self-centered by a spring and an interlocking ball positioned between shaped indentations in its body and in the worm shaft bore.

Wheel movement causes rotation of the valve from its neutral position, when it partially diverts the oil through feed grooves to one of the ports communicating with that side of the piston appropriate to the direction of turn, thus exerting hydraulic thrust on the nut. The degree of oil admission to the cylinder and corresponding restriction of return-flow to the reservoir is progressive, and proportional to the effort applied to the wheel.

The system operates at a maximum pressure of 650 psi, and the pump incorporates a relief valve to prevent damage when a front wheel is turned against a curb or similar obstruction. Hydraulic pressure is also utilized to seat the rocker arm firmly against the nut. ■

INDUSTRY Reviews and Previews

(*Continued from page* 62)

age 1958 automobile, according to AZI, had 64-65 lb of zinc. If 1959 car production reaches an estimated 5.5 million units and per-car use of zinc rises even slightly, considerable tonnages of the metal will be required by the industry.

A troublesome problem in recent years has been the premature corrosion of plated zinc die castings. AZI has had a project going for over two years at Battelle Memorial Institute aimed at finding corrective measures. Results of tests made to date favor modified plating procedures, which are being adopted commercially to a large extent. These involve bright "crack-free" chrome plating and/or duplex nickel plating under conventional chrome. The evidence is very strong that the corrosion resistance of parts so plated is several times that of systems which were considered standard a short time ago.

Consumption of zinc in other forms—brass, rolled sheet, anodes for cathodic protection, zinc oxide for rubber and paint—has held its

(*Turn to page* 71, *please*)

Automated Press and Welding Lines at Volkswagen Plant

By David Scott

PART I

ONE of the key projects in Volkswagen's expansion and decentralization program is the press and welding shop at Wolfsburg. Equipment in use there is for the car roof and door panels.

Roof pressings are made on a nine-station transfer line that combines stamping and welding operations synchronized to work on a 20-second cycle. Since the roof is integrated with the windshield and rear window surrounds in a single pressing all stations after the first three for the deep draw are double-sided, working both ends simultaneously.

An unusual feature is the three pairs of inclined presses used to punch and form the glass openings. These are followed by three welding presses that tack on minor components.

A total of 15 operators is used, and all loading positions are interlocked so that any failure or negligence stops the entire line. A constant picture of operations and cycling is given on an illuminated panel of the main control console. This equipment was built by German manufacturers to Volkswagen design and specifications.

General view of the nine-station roof line, showing the three-station double-sided welding presses in the foreground and the three sets of inclined presses at the rear. The circulating monorail at the left carries rear window reinforcement sub-assemblies to the operator at the first welding position.



At the start of the line, 50 by 96-in. sheets of 0.034-in. thickness are hand-fed into the shuttle loader of the first Hilo (Hiltmann & Lorenz) 1100-ton double-action press that makes the basic draw. After the stroke the panel is extracted by a pair of iron hands that drop it onto two padded rails.

It is picked up by the lower arms of a two-stage turnover mechanism, then swung through 100 deg to the second pair of arms which lower it on to the shuttling conveyor. The second press, loaded by this conveyor, is a 150-ton Hilo that trims the stamping.

An induction heating unit following the second press anneals the pre-formed windshield impression prior to punching out the opening and finishing the edges, thereby eliminating the risk of cracking the sheet metal. Work is carried on a three-position conveyor that elevates to raise the stampings against the four high-frequency coils shaped to cover the ends of the windshield area. A limit switch operated by the rising roof panel actuates the heating circuit.

Similar equipment on the other side of the line anneals the rear window area. After this treatment the panels are shuttle-loaded into



Three pairs of 150-ton inclined presses simultaneously punch out the windshield and rear window openings in progressive steps. These close-up views of the die areas of the first press show the annealed portion of the stampings. Roof panels are conveyed between lower dies by a shuttling transfer mechanism with four vertical arms that lift each corner.

the third press, another 150-ton Hilo, for restriking and turning up the rain gutter.

Following this there is a three-position conveyor incorporating oil spray guns and compressed air jets for cooling and lubricating the annealed spots in preparation for the next operation. As before, a limit switch closed by the rising panel controls the electrically-operated valves.

Three sets of inclined presses then cut out the windshield and rear window openings. These are 150-ton mechanical units made to VW design by Kircheis, a former East German manufacturer, in conjunction with Krupp. Work is automatically moved through these stations by an elevating transfer mechanism that picks up each curved stamping by slender vertical arms engaging its four corners, then travels forward and drops it on to the next lower die. A complex rack and pinion drive regulates the traverse and fast return between the strokes.

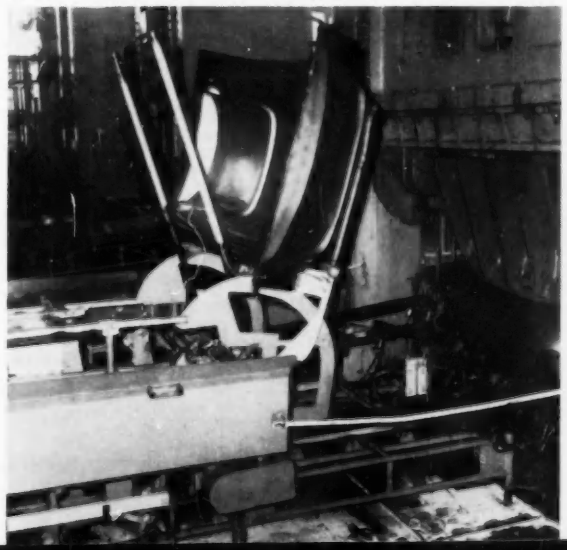
At the first press the windshield area is partially cut out in order to equalize the metal stresses when the glass surround is finally drawn and punched. The off-cut is later used as a blank for a small pressing, and its figure "8" shape is also determined by this factor.

Meanwhile, the mated press cuts out a large oval from the rear window depression, while punching two rows of holes beneath it which will be joined to form the air-intake slots for engine cooling.

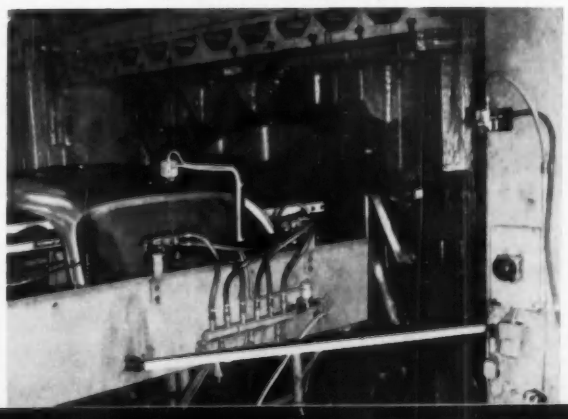
The subsequent two pairs of (*Turn to page* 126, *please*)

■

Fully-drawn roof panels leaving the third Hilo press are inverted onto the conveyor by a two-stage turnover mechanism. The closing die is already on its next downstroke.



Spray guns and air jets oil and cool the annealed windshield corners prior to punching out the opening. This equipment, on the exit conveyor from the third Hilo press, is duplicated for the rear window. The induction heating units follow the second press.



Details of the New Allis-Chalmers Diesel

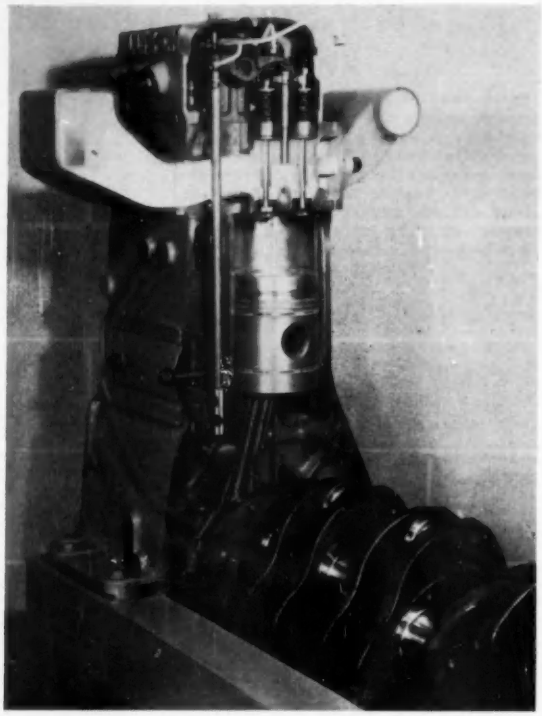
ALLIS-CHALMERS Engine-Material Handling Division has announced a new 6-cylinder Diesel engine, of the high rpm type, produced in both turbocharged and naturally-aspirated models. The new engine, designated the 21000 in the turbocharged type, and 16000 when naturally aspirated, is designed to turn at 2000 rpm to fit into torque converter applications effectively. The turbocharged model develops 340 hp at 2000 rpm, while the naturally-aspirated engine develops 230 hp at the same rotational speed.

More than five years in development, the new engine features a combustion system for which high fuel economy is claimed. It makes use of special contouring of the piston, with a crater in the center of the piston head and a conical projection in the center of the crater head. Along with a mask on the intake valve to direct the air into a swirling pattern, this gives an intimate and controlled mixing of fuel and air. Allis-Chalmers' engineers report that the air and fuel swirl together in a toroidal pattern, in the combustion chamber, to produce a thorough mixture before ignition. Because the position of the mask on the valve must be fixed, there is no valve rotation. The assurance of a more intimate mixture of air and fuel permits a reduction of excess air in the combustion chamber, reducing heat losses.

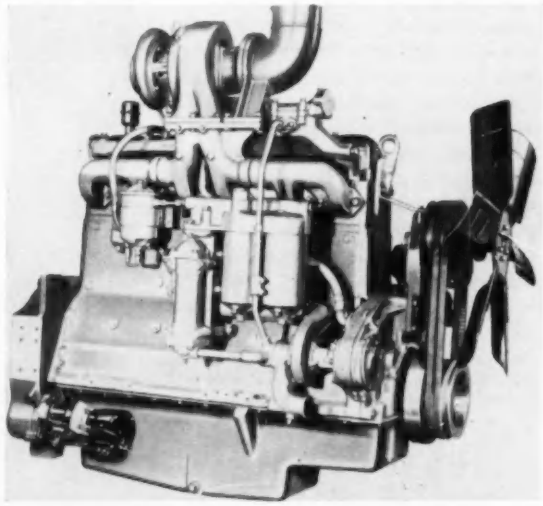
The engine is a four-stroke, 844-cu-in. design, with 5¼ in. bore and 6½ in. stroke. The 21000 develops 925 lb-ft of torque at 1400 rpm, and the 16000 develops 670 lb-ft at 1450 rpm. Compression ratio is 14.5 to 1.

The crankshaft is fully counterweighted and fitted with a vibration damper. Aluminum pistons have a cast iron insert for the top piston ring. Full pressure lubrication is provided with full-flow filters. A Barnes gear-type fuel transfer pump is used in combination with a two-stage fuel filter. The turbocharged model has an AiResearch turbocharger; and a Bosch fuel injector pump is used on both models.

Block and head are of cast iron. No attempt has been made to save weight as the engine is intended for heavy-duty service. Basic engine weight is about 3000 lb, giving a weight-to-horsepower ratio of about 9 to 1 for the turbocharged model. A "clean" design is obtained by carrying the oil and water passages inside the castings. The oil galleries within the engine are drilled passages.



Cutaway view of cylinder assembly showing cast iron cylinder sleeve, valve arrangement, etc.



The 21000 engine which develops 340 hp at 2000 rpm

The new engine is now being installed in Allis-Chalmers earthmoving equipment. The turbocharged model is used in the HD-21 crawler tractor, and the naturally-aspirated engine is used in the HD-16 crawler tractor and the TS-260 motor scraper. It is also applicable to 130-200 kw generator sets, marine uses, off-highway vehicles, power units, etc. ■

Trends in the CONSTRUCTION EQUIPMENT INDUSTRY

Review of 1958—Outlook for 1959

THE construction machinery and equipment industry operated at about 60 per cent of capacity during 1958 with shipments off somewhat from the 1957 level (see table). Inventories carried over from 1957 are estimated to have been $500 million (normal inventory position is about $100 million). These, however, were gradually reduced during the year to manageable levels.

Strikes plagued the industry throughout 1958, but most labor difficulties had been resolved by the year's end. According to Bureau of Labor statistics, the industry had 40,000 fewer employees in 1958 than it had in 1956. Manufacturers' profits for various quarters of the year were far below those for corresponding periods of 1957.

SHIPMENTS OF CONSTRUCTION MACHINERY AND EQUIPMENT

	(Billions)	Per Cent Price Increase
1955	$1.9	2
1956	2.4	2
1957	1.8*	2
1958	1.7*	1
1959	2.0*	4

* Estimated

The U. S. produces an estimated 95 per cent of all construction machinery and equipment produced in the Free World area. Trade controls, blocked currency, and import limitations are restricting shipments from the U. S. However, the U. S. producers have 31 overseas manufacturing plants, and equipment unobtainable from the U. S. might be shipped from these overseas factories.

Production of construction machinery and equipment during 1959 will be geared to levels of activity in end-user areas, such as mining, forestry, public roads, oilfields, housing, reclamation, agriculture, industrials, etc. All of these fields were operating at reduced levels in 1958 and are expected to advance in 1959. This factor should automatically create a higher production of necessary construction machinery and equipment. Prices may advance about four per cent across the board.

Crawler Crane Strips Down

A new 40-ton crawler crane that can be stripped down, within two hours, to about 32,000 lb and 96-in. overall width, for meeting transport limitations, was recently announced by Link-Belt Speeder Corp. It weighs just over 39 tons, but can pick up and carry a 40-ton load.

Designated the LS-108, the crawler base is 15 ft long and over 14 ft wide, and has 42-in. shoes. The unit can mount, unassisted, 160 ft of tubular boom and jib. Hydraulic steering, hydraulic controls, and two-speed travel in either direction are standard features. Reversing clutches for either or both main drums, a third drum, hydraulically-controlled swing brake, torque converter, and elevated cab are available options.

In stripping for transport, the counterweight is first removed by the powered gantry method, and the crawler then mounts a low-boy trailer from the side. After blocking up under the cross axles, removing the axle bolts, and uncoupling the drive sprocket from the traction shaft, one of the side frames is swung off by the crawler crane. This is repeated with the other side frame, thus reducing the width of the unit to 96 in.



Link-Belt Speeder's new 40-ton crawler crane can be stripped to 96-in. overall width and about 32,000 lb, within two hours. The counterweight is removed by the powered gantry method, after which the LS-108 mounts the low-boy from the side and removes its own crawler side frame assemblies as pictured.

New Motor Scraper

Allis-Chalmers Mfg. Co. has introduced a new medium-size motor scraper, the TS-260, with a capacity of 12.5 cu yd struck and 17 cu yd heaped. Powered with A-C's new 16000 six-cylinder Diesel engine, developing 230 hp at 2000 rpm, it offers such power-to-work ratios as 18.4 hp per struck yard and one horsepower per 370 lb of gross weight. The unit weighs 44,800 lb.

The clutch is a 17-in. single-

(*Turn to page* 110, *please*)

• • INDUSTRY STATISTICS • •

WEEKLY U.S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending Jan. 3, '59	Weeks Ending Dec. 27, '58	Calendar Year 1958	Calendar Year 1957
PASSENGER CAR PRODUCTION				
Total—American Motors Corp.	6,222	5,865	217,281	114,004
Chrysler	1,168	1,127	49,512	118,718
De Soto	935	871	36,692	117,750
Dodge	2,878	2,525	114,591	293,616
Imperial	328	381	13,673	37,945
Plymouth	7,431	6,007	386,948	655,006
Total—Chrysler Corp.	12,740	10,881	581,416	1,223,035
Edsel	1,061	1,365	26,563	84,607
Ford	22,065	22,523	1,038,560	1,522,408
Lincoln	630	633	25,871	37,870
Mercury	2,937	4,015	128,428	274,820
Total—Ford Motor Co.	27,293	28,536	1,219,422	1,889,705
Buick	6,062	6,712	257,124	407,271
Cadillac	3,048	2,980	125,501	153,236
Chevrolet	26,563	33,958	1,255,943	1,522,549
Oldsmobile	6,966	7,424	310,795	390,091
Pontiac	5,964	6,436	219,823	343,298
Total—General Motors Corp.	48,601	57,510	2,169,186	2,816,445
Packard	.....	.....	1,745	5,495
Studebaker	2,768	2,206	55,124	67,394
Total—Studebaker-Packard Corp.	2,768	2,206	56,869	72,889
Checker Cab	.....	73	3,267	3,871
Total—Passenger Cars	97,624	105,071	4,247,441	6,120,029
TRUCK AND BUS PRODUCTION				
Chevrolet	6,092	6,261	278,632	351,740
G. M. C.	1,177	1,315	61,768	69,675
Diamond T	123	130	5,981	5,845
Divco	49	.....	2,919	2,871
Dodge and Fargo	794	732	58,665	76,616
Ford	4,806	4,166	242,890	337,123
F. W. D.	13	21	1,227	1,073
International	.....	.....	79,914	121,775
Mack	261	261	14,308	17,308
Studebaker	218	288	10,563	13,642
White	244	236	17,403	18,775
Willys	.....	1,710	92,099	75,860
Other Trucks	50	45	2,910	4,143
Total—Trucks	13,827	15,195	869,279	1,096,446
Buses	45	45	3,000	3,956
Total—Motor Vehicles	111,496	120,311	5,119,720	7,220,431

RETAIL CAR SALES BY PRICE GROUPS*

NUMBER OF CARS

Price Group	October 1958 Units†	October 1958 % of Total	October 1957 Units†	October 1957 % of Total
Under $2,000	5,621	1.96	1,017	.23
$2,001 to $2,500	120,037	41.80	285,360	64.47
$2,501 to $3,500	136,661	47.58	124,440	28.11
Over $3,500	24,860	8.66	31,824	7.19
Total	287,179	100.00	442,641	100.00

Price Group	Ten Months 1958 Units†	Ten Months 1958 % of Total	Ten Months 1957 Units†	Ten Months 1957 % of Total
Under $2,000	41,725	1.19	23,565	.48
$2,001 to $2,500	2,205,216	63.01	3,102,188	63.22
$2,501 to $3,500	927,428	26.50	1,391,254	28.36
Over $3,500	325,295	9.30	389,508	7.94
Total	3,499,664	100.00	4,906,515	100.00

DOLLAR VOLUME OF SALES

Price Group	October 1958 Dollars	October 1958 % of Total	October 1957 Dollars	October 1957 % of Total
Under $2,000	$ 10,247,034	1.31	$ 1,593,639	.14
$2,001 to $2,500	283,469,039	36.32	644,056,988	55.37
$2,501 to $3,500	378,891,774	48.54	351,194,720	30.20
Over $3,500	107,964,818	13.83	166,168,179	14.29
Total	$ 780,572,665	100.00	$1,163,013,526	100.00

Price Group	Ten Months 1958 Dollars	Ten Months 1958 % of Total	Ten Months 1957 Dollars	Ten Months 1957 % of Total
Under $2,000	$ 74,485,504	.80	$ 42,017,778	.33
$2,001 to $2,500	5,161,919,701	55.49	6,974,795,617	54.25
$2,051 to $3,500	2,626,367,046	28.23	3,928,587,983	30.56
Over $3,500	1,439,953,295	15.48	1,910,952,499	14.86
Total	$9,302,725,546	100.00	$12,856,353,878	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

REGISTRATIONS OF FOREIGN CARS

*First Eleven Months**

1958		1957	
Volkswagen	71,125	Volkswagen	56,974
Renault	42,245	Renault	20,102
English Ford	29,851	English Ford	15,164
Fiat	18,469	MG	12,364
Hillman	16,520	Metropolitan	10,905
All Others	157,979	All Others	67,463
Total	336,189	Total	182,972

* Does not include returns for Oregon from July through November.

1958 NEW REGISTRATIONS

Based on Data from R. L. Polk & Co. and Dept. of Motor Vehicles, State of Oregon

Arranged in Descending Order According to the Eleven Month 1958 Totals

NEW PASSENGER CARS

Make	November 1958	October 1958	November 1957	Eleven Months 1958	Eleven Months 1957
Chevrolet	61,950	69,960	104,165	1,101,038	1,316,502
Ford	94,849	72,456	101,308	904,590	1,364,094
Plymouth	27,603	30,742	35,819	359,106	558,533
Oldsmobile	20,011	17,806	24,315	269,509	335,522
Buick	21,413	19,287	26,423	230,920	358,426
Pontiac	15,006	13,713	19,953	199,072	293,743
Rambler	19,896	19,076	8,565	162,324	82,202
Dodge	11,001	12,809	16,631	124,356	241,962
Mercury	7,127	9,529	13,024	122,291	245,736
Cadillac	5,935	6,116	9,175	108,051	127,910
Chrysler	3,535	3,820	7,110	53,981	98,764
De Soto	3,282	3,543	7,223	44,172	97,118
Studebaker	5,057	2,597	4,872	37,965	58,071
Edsel	3,321	1,888	5,277	33,953	21,150
Lincoln	1,833	1,549	3,140	23,697	33,666
Imperial	1,041	845	2,068	13,293	30,606
Metropolitan	956	1,227	827	11,426	11,013
Packard	77	153	193	2,506	4,972
Misc. Domestic	351	160	876	2,945	17,625
Foreign	34,835	37,634	17,550	328,449	174,281
Total—All Makes	338,881	324,891	408,534	4,133,644	5,471,900

NEW TRUCKS

Make	November 1958	October 1958	November 1958	Eleven Months 1958	Eleven Months 1957
Chevrolet	15,222	16,552	18,987	220,622	270,610
Ford	17,831	18,930	19,331	186,770	*58,520
International	7,461	8,532	7,896	82,083	89,422
G. M. C.	4,571	4,851	4,861	50,308	57,689
Dodge	2,742	2,254	4,709	32,800	45,181
Willys Truck	1,622	1,682	1,310	12,699	13,854
White	1,195	1,105	856	11,107	13,721
Mack	838	1,206	958	10,873	12,290
Willys Jeep	868	875	574	6,684	6,010
Studebaker	276	222	403	3,755	6,139
Diamond T	242	295	261	2,700	3,160
Divco	191	206	169	2,015	2,433
Brockway	99	106	79	851	680
Kenworth	75	92	46	796	962
Peterbilt	30	59	35	399	471
F. W. D.	29	34	18	349	406
Misc. Domestic	70	99	60	830	791
Foreign	2,564	2,987	1,489	25,486	13,586
Total—All Makes	55,926	57,091	61,920	651,127	795,925

INDUSTRY Reviews and Previews

(*Continued from page* 65)

own during the recession. It is expected to increase with the expanding economy, as well as through technical improvements developed by research.

A significant development in the zinc world is the major expanded research program sponsored and supported jointly by American Zinc Institute and Lead Industries Association, representing 20 U. S. and foreign producers. Optimism is high for consolidation and expansion of present markets, as well as the development of new ones. Research budgets in lead and zinc for 1959 are about twice what they were for 1958.

NICKEL THE year 1958 was marked by dramatic changes in the nickel industry, according to Dr. John F. Thompson, chairman of the board of International Nickel Co. of Canada, Ltd. Two major highlights of the year were the abundant supplies of nickel throughout the Free World for both civilian and military purposes and the vigorous competition for new markets.

The Free World attained a new high in annual nickel production capacity in 1958, estimated at about 525 million lb. Total nickel consumption in the area during 1958 amounted to between 325 million and 335 million lb, compared with 415 million lb in the previous year. The principal cause of the decrease was the business recession in the U. S. and Canada which had a particularly strong effect upon the production of durable goods.

Today's Free World annual nickel production capacity of nearly 525 million lb is expected to rise progressively in the next few years Dr. Thompson states. This capacity is estimated to reach about 550 million lb in 1959; 600 million lb in 1960; and 650 million lb in 1961.

Projected 1961 nickel production capacity will be about double estimated total consumption in 1958. As a result, steady ample supplies of the metal will be available in the years ahead to meet civilian needs.

In October, 1957, the Government authorized the diversion to industry of some 135 million lb of nickel scheduled for stockpile delivery in 1958. Due to the oversupply, much of this nickel, a large portion of which was premium-priced, did not find markets. The Government has announced it will also offer to industry in the U. S. all the nickel—about 100 million lb — contracted for stockpile delivery in 1959.

Free World nickel consumption by fields in 1958 is estimated as follows: stainless steels, 28 per cent; engineering alloy steels, 16 per cent; nickel specialty alloys, 16 per cent; foundry products, 15 per cent; electroplating, 14 per cent; copper and aluminum base alloys, six per cent; and miscellaneous, five per cent. These figures show that the steel industries continued to be the largest consumers of nickel.

The stainless steels accounted for the largest use of nickel by the steel industries in 1958. Although total production of stainless steel dropped during the year, the percentage of the nickel-containing grades showed some increase relative to the total. With a plentiful supply of nickel assured for future production, it is expected that the use of nickel-containing stainless steels will continue to increase in such fields of application as automotive functional trim.

Consumption of primary nickel in engineering alloy steels increased in the U. S. in 1958 in the face of a reduced rate of production for the steel industry as a whole. Free availability of nickel has made it possible for alloy steel consumers to return to the higher nickel-containing types for established applications in automobiles, trucks, tractors, aircraft, military equipment, farm machinery, and roadbuilding and transportation equipment.

High-nickel alloys are specified for most of the first stage jet engine turbine blades. In the more advanced propulsion systems, they are especially well suited to resist the corrosive action of the new boron - containing high energy fuels.

The first "so-called" manned satellite, the X-15 built by North American Aviation, represents the first use of a heat-resisting alloy as fabricated sheet metal skin capable of withstanding the weakening effect of aerodynamic heating. Inconel X nickel-chromium alloy was chosen as the most suitable material for the body of this space ship.

The new commercial jet aircraft are important users of nickel alloys. The engines, for instance, use at least three times as much nickel as piston engines. It is estimated that a typical large jetliner employs about two tons or more of nickel in various alloys. The engines account for about 1½ tons, the balance being employed in electrical equipment, structural members, firewalls and other components. Nickel alloys are also being used for honeycomb structures of high-speed air vehicles.

Complementary to aircraft developments, there has been substantial progress in the development of small gas turbines for both transport and stationary uses. These smaller units make use of the wrought nickel-chromium alloys as well as other high-nickel cast alloys.

Automotive producers in the U. S. have increased the thickness of the nickel plating underlying the chromium, thus insuring the quality plate necessary to secure long-lasting bright finish for automotive trim. Relatively thick nickel deposits are now being used on processing and transportation equipment to prevent product contamination, and such special products as hypersonic wind tunnel nozzles, grids, screens, and special molds are now being electroformed. Another application indicating future growth is the bright nickel plating of aluminum products.

A good potential market, dependent on both product and market development, is the nickel-cadmium

storage battery. Taking advantage of a nickel-carbonyl powder specially developed for the purpose by Inco, various battery manufacturers are now expanding their facilities to develop and enlarge this market.

MAGNESIUM

MUCH of magnesium's past growth has come initially from the stimulus of military demand. In 1958, somewhat less than 50 per cent of total consumption is estimated to have been in direct and indirect military uses. Civilian uses for magnesium have been developed in increasing number since World War II. The long-term average growth of magnesium consumption has been estimated at about 15 per cent per year.

In recent years, non-structural uses have taken more metal than structural uses. Non - structural uses include alloying aluminum, the production of titanium and zirconium, anodes for cathodic protection, and similar applications. Structural uses include aircraft and missiles, machinery and tools, vehicles, materials handling equipment, etc.

Production of primary magnesium in 1958 is estimated at about 30,000 tons and consumption at about 37,000 tons. In 1957, primary production was kept at a high level, with the year's output reaching 81,263 tons consumption was 44,442 tons, so producers' inventories were built up. It is not expected that any increase in production will be needed in 1959 to support the higher level of consumption anticipated. Secondary recovery of magnesium from scrap in 1958 is estimated at 8500 tons, as compared with 10,658 tons reported for 1957.

Shipments of primary magnesium mill products, and castings, increased in 1958 from the low level of the fourth quarter of 1957. This upward trend is expected to continue throughout 1959.

Several aircraft and missile programs are moving forward fast and will increase the demand for magnesium castings and mill products. Magnesium is being designed into several space projects and is already being used in a number of different missiles. Usage in other types of defense projects, such as the Army Mechanical Mule and similar vehicles, is expected to be at an increased level in 1959.

Commercial uses should consume larger quantities of magnesium in 1959. In non-structural applications, magnesium consumed in making aluminum alloys is expected to increase about 20 per cent—25 per cent or more over the 1958 consumption as aluminum production goes up.

The use of magnesium in certain processes for titanium and zirconium production may increase moderately, and production of anodes for cathodic protection should go up. The use of magnesium should also increase in automotive die castings, truck bodies, portable tools, tooling plate, hand trucks, dock boards, etc.

METALLURGY

THE development of high-temperature types and new forming methods marked 1958 as a year of progress in metals, according to a year-end report released by the American Society for Metals. The melting of metals in jets of heat ranging up to 30,000 F, the attainment of strengths exceeding 400,000 psi in steels, the perfection of techniques for the forming of metal parts by controlled explosions, and the rolling of metal strip directly from metal powders were among the outstanding metals engineering advances of the year.

The problems of developing high-temperature materials for aircraft and missile use continue to attract attention. Metallurgists and metals engineers, however, are now diverting some of their efforts to meet conditions at the other end of the temperature scale.

Oxygen, nitrogen, hydrogen, and fluorines are being used as energy sources for missiles as well as for other applications. In liquid form, these elements must be held at temperatures ranging from —346 to —434 F. There are only a few metals capable of retaining ductility at temperatures as low as these and then only under certain conditions. Thus, the metals experts are preparing to deal with a multitude of requirements through a temperature range starting with —434 F and continuing on upward to 4000 or 5000 F.

A former research tool known as the plasma-jet is now being adapted to production uses and is capable of developing temperatures up to 30,000 F. The high temperature is being used to melt and apply metals and compounds with extremely high melting points. Tungsten, tantalum, columbium, and other refractory metals, as well as their oxides, carbides and compounds, can be used to build shapes on mandrels or to coat surfaces of other materials.

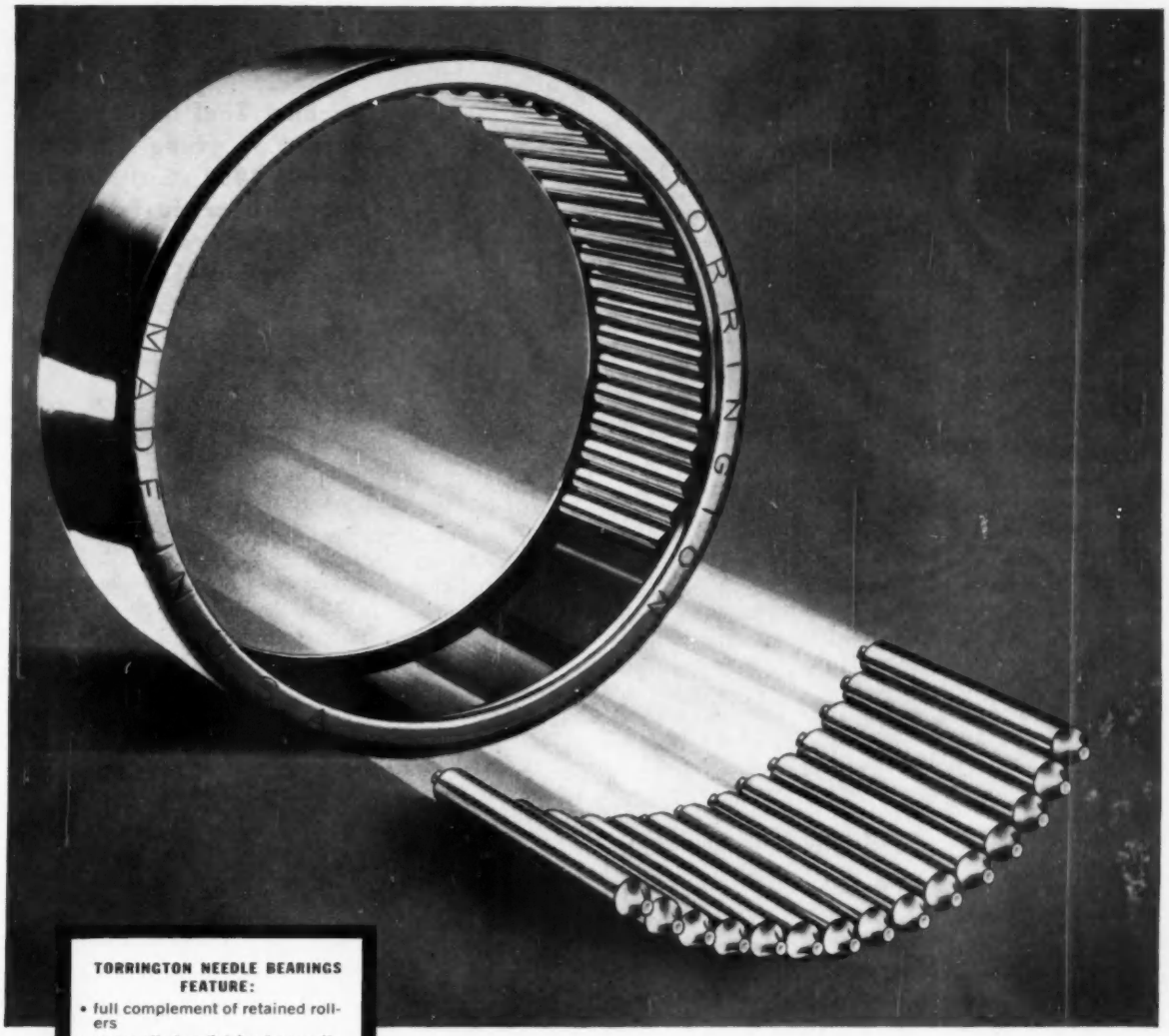
The jet is actually ultra-hot gas which is shot from the unit by streams of high velocity inert gases which have passed through an electric arc. Metals to be deposited on a surface are injected as powders into the gas stream or fed in the form of wire into the jet. In addition to producing parts capable of withstanding high temperatures, the process is expected to be used for making electronic parts and special chemical process assemblies from materials that might not otherwise be formable.

Metallurgists are in a constant battle to provide designers with stronger materials that are relatively easy to form and fabricate into engineering structures. Two such steels were introduced during 1958. One is an air-cooling, ultra-high strength alloy steel available in sheet form which develops tensile strengths up to 280,000 psi. It is reputed to have good formability and to be readily welded. The steel is formed in the annealed condition, then heated and permitted to cool in air at room temperatures. Then follows a tempering treatment at a lower temperature and another air-cooling cycle.

The second steel is only a few steps removed from the research laboratory. It has shown tensile strengths of more than 400,000 psi in tests and is said to retain its ductility down to —385 F.

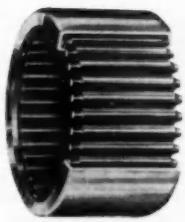
The full potential of the "explosive forming" process is only beginning to be realized, although many parts are now made in this manner. In addition to producing

(*Turn to page* 88, *please*)



TORRINGTON NEEDLE BEARINGS FEATURE:

- full complement of retained rollers
- unequalled radial load capacity
- low coefficient of starting and running friction
- low unit cost
- long service life
- compactness and light weight
- runs directly on hardened shafts
- permits use of larger and stiffer shafts



Here's Why Torrington Needle Bearings Provide Maximum Radial Load Capacity

The Torrington Needle Bearing's full complement of small diameter rollers provides the largest possible number of bearing contact lines in the load zone.

This feature gives Needle Bearings a higher radial load capacity than any other bearing of comparable size. Precision rollers ensure smooth anti-friction performance with low coefficient of starting and running friction, to match this unequalled capacity. Rollers are positively retained by the turned-in lips of the outer shell, permitting simple, economical installation and assembly.

Torrington experience spans twenty years in design and application of Needle Bearings to equipment of all types. This experience is at your disposal to help you secure the ultimate in performance built into every Torrington Needle Bearing. **The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.**

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • BALL • NEEDLE ROLLERS • THRUST

News of the MACHINERY INDUSTRIES

Machine Tool Industry Expected to Have a Better Year in 1959. Government Agency Forecasts Order Level Moderately Above That During Second Half of 1958

By Charles A. Weinert

1959 Prospects for Machine Tools

Moderately-improved business activity in the machine tool industry during 1959 is predicted in a newly-released Government report. The comprehensive roundup was prepared by the Metalworking Equipment Div., Business and Defense Services Administration, U.S. Dept. of Commerce. Portions of the report bearing on the 1959 outlook are given below.

"The outlook for 1959 for the machine tool industry is somewhat encouraging when compared to 1958, but it is not too bright when compared to 1954-57.

"Though an increase in business activity was common to many sectors of the industrial economy since the spring of 1958, available information indicates that the important customers of the machine tool industry, such as the automotive, aircraft, steel, farm equipment, and other metalworking industries, have all the capacity they need to handle the estimated 1959 activities. It appears, therefore, that there will be only moderate improvement in machine tool buying to equip new plants. Thus, as in 1958, replacement markets seem to offer the most encouragement to the industry.

"Notwithstanding the vast number of obsolete machine tools in the industrial plants of the nation, industry leaders, on the basis of recent experience, are not too optimistic concerning the replacement market. In their opinion, there are many obstacles discouraging and impeding the procurement of new machine tools by the manufacturers' establishments of the nation. They contend that improvement is needed in the tax depreciation laws. For tax purposes, many companies are required to depreciate machine tools over a period of as much as 25 years, with some companies having to use a period of 30 years. Because of rapid technological advancements, it is anticipated that machine tools will become obsolete within a 7 to 10-year period. Longer tax depreciation life discourages the acquisition of new machine tools and other capital goods, they argue.

"During the coming months, there are indications that the Federal Government will increase its purchases of machine tools. The Department of Defense has appropriated $41 million for its machine tool replacement program for fiscal year 1959. During the initial phase of this program, $10 million has been assigned to each of the three military departments, Army, Navy and Air Force. It is expected that after satisfactory justifications for machine tool replacement have been submitted and approved, additional funds will be made available.

"The outlook for export business continues to be bleak. During 1957 and 1958, the industry lost a substantial part of its foreign markets and some of the domestic markets to foreign competitors, and it appears that the industry will be faced with the loss of more of its markets in 1959. The prices of domestic machine tools as compared to foreign-made machine tools, together with trade assistances and bonuses received by foreign builders from their governments, and import restrictions, will tend to weaken the competitive position of domestic builders in the world market. The average wage rate in the domestic machine tool industry is approximated at $2.60 per hour as compared to European wages ranging from $.40 to $1.20 per hour.

"It is estimated that the production outlook for the industry for the first six months of 1959 will follow closely and be moderately above the level of new orders for the second half of 1958. During 1957 and 1958 the shipments of the industry exceeded new orders. The industry is fast approaching the minimum backlog level and it is anticipated that the builders will limit their shipments in 1959 more closely to the level of new orders. New orders for the first half of 1959 are expected to be moderately above the level for the second half of 1958, and shipments for the second half of 1959 should reflect this increased activity.

"The above factors lead to the estimate that shipments for the cutting type segment of the industry for 1959 will approximate $420 million and shipments for the forming and shaping type segment will approximate $155 million."

Distributors Association Sponsors Proposal Contest

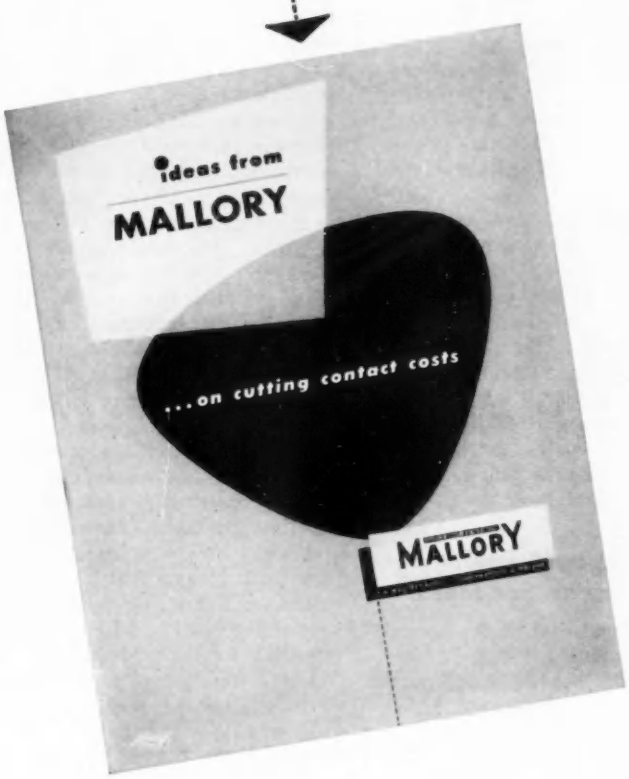
As a means of "improving the art" of preparing and submitting quotations on machine tools, the American Machine Tool Distributors' Association is sponsoring a machine tool proposal contest.

In announcing the project, Wm. L. Walker, chairman of the Association's public relations committee, said: "Modern cost cutting machine tool applications require a more comprehensive analysis of the customers' needs.

(*Turn to page* 130, *please*)

Want to Cut Contact Costs?

See This Mallory Book!



MAYBE you have been overlooking some important savings that could be made in the electrical contacts you use in your products. Mallory has been helping design engineers uncover new sources of cost reduction through Contact Engineering Service. To give you some thought-starters on the subject, we've collected a number of actual case histories and put them in a convenient booklet.

In the reported savings on contacts for products ranging from magnetos to circuit breakers, we're sure you'll find ideas that are closely related to your own applications.

And we're sure, too, that we can do the same for you . . . by putting our long experience to work for you in engineering contacts, selecting the right Mallory alloy, and coordinating design of complete contact assemblies.

Write for a copy of this booklet . . . and call on us for a consultation on the cost-cutting possibilities of your particular contact problem.

Expect more . . . get more from

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

Serving Industry with These Products:

Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical — Contacts • Special Metals • Welding Materials

Circle 139 on Inquiry Card for more data

AIR BRIEFS

By David A. Partridge

Cutbacks Ordered For B-58 Program

Delivery cutbacks ordered for the Air Force's fastest bomber, the B-58, are yet another sign of military concern over budget limitations. Plans had called for buying 47 of the planes from the Convair Div. of General Dynamics Corp. during this fiscal year. But the Air Force claims that high cost and design alterations will allow only 36 to be added to the Nation's air arm.

The service had placed orders for 30 of the B-58's and combined with the new number now ordered will have a grand total of 66—more than enough to equip one wing of bombers. The number delivered so far is not revealed.

Cost of the B-58, a Mach 2 aircraft, has been withheld from public information but the unit price tag is expected to read about $5 million when production is further along. Present cost is far higher.

Complete Aircraft And Aircraft Engines

Shipments of complete civilian aircraft, as measured by airframe weight, amounted to 1,545,600 lb in October, 1958, according to the Bureau of the Census and the Civil Aeronautics Administration, Department of Commerce. During October of last year, 628 planes valued at $49.3 million were shipped. Unfilled orders for civilian planes of 3000 lb airframe weight and over amounted to 666 at the end of that month, 12 per cent under the backlog of one year ago. During the same month, 811 reciprocating type engines valued at $3.3 million and totaling 220,900 hp were shipped.

Brief Air Briefs

Scheduled Airlines spent $24 million for newspaper advertising during 1958, or four times the amount spent by U. S. railroads—The largest transport helicopters in commercial use today carry 12 to 15 passengers at a cost of about 20 cents per mile. Future turbine powered helicopters, able to carry 25 passengers, can be expected to have a direct seat-mile cost of around 10 cents—An estimated 70 per cent of the money to be spent on the Air Force B-70 and F-108 weapon systems will be spent outside the company, reports North American Aviation, Inc.—Sales of the aircraft and missile industry for 1958 are estimated at $11.8 billion, about the same as in 1957—In the ten years following the end of World War II, the aircraft industry has invested $1 billion of its earnings in research and development programs and facilities for aircraft and missiles, and by 1961, at the present rate, will have invested over $1 billion more.

Unique Support Equipment Ups Air Force Spending

About 78 per cent of the ground support equipment (GSE) needed for a modern bomber squadron is non-standard, according to Major General A. G. Hewitt, Director of Maintenance Engineering, Air Force Engineering Headquarters, Washington, D. C. Therefore, when a new bomber goes into production much existing support equipment fast becomes obsolete.

For example, converting an F-84 squadron to F-100's takes about 220 new GSE items. Approximately 300 new items are required to convert a squadron to F-104's. In many cases these items are not standardized and require special design and development. This situation will continue to increase in size and unnecessary cost until better government/industry coordination occurs, the general said.

Logistics Ballistic Network

A system that can start ballistic missile parts on their way to any part of the world within two hours' notice is in operation at Rocketdyne, a Div. of North American Aviation, Inc.

Known as LogBalNet (logistics ballistics network), the plan uses contractor storage sites from which to supply the needs of ballistic missile operations anywhere in the world. By means of an IBM transceiver system, cards punched at the North American Van Nuys facility are automatically repunched at Norton AFB and immediately fed into an IBM 705, where the information on supply levels is stored in "memory" units.

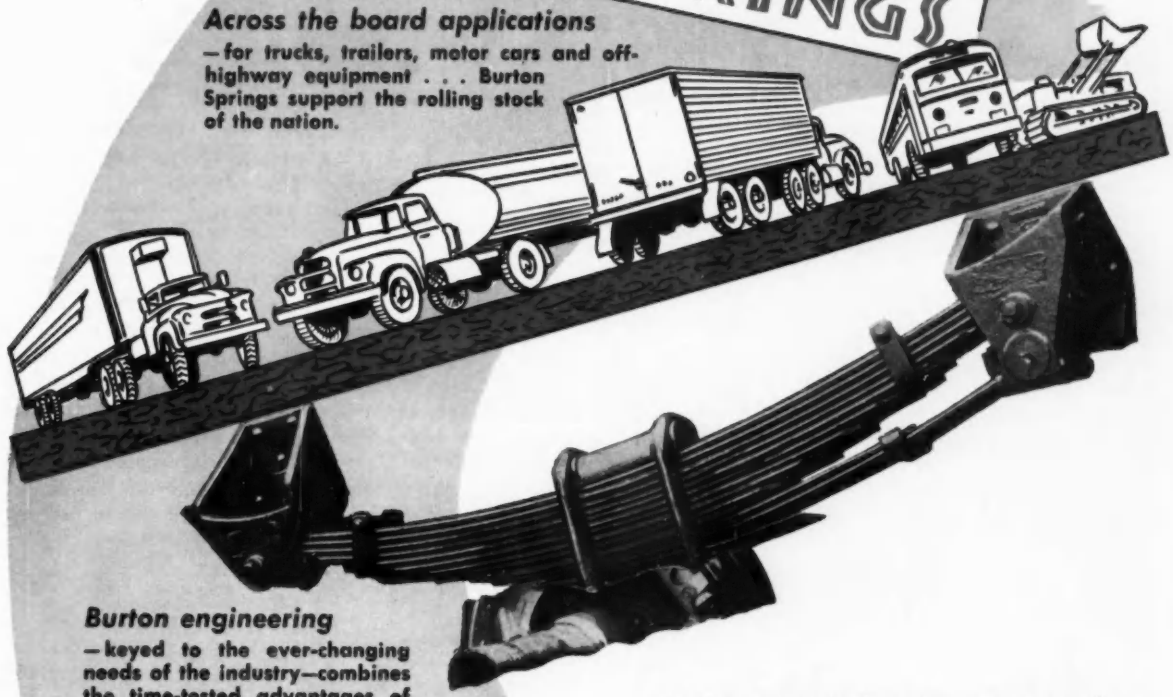
With this system in operation, Norton AFB knows at all times exactly how many spare missile parts are available, where they are, and when they will arrive should they be in transit. This cuts down on the amount of warehouse stocks around the world and cuts supply time to a minimum. In the case of Priority One items, the needed parts are on the way to the requester within two hours. At the same time the 705 computer at the nerve center will know exactly how much its supply has been depleted by the delivery.

Convertible Aircraft Congress

Twenty years of development work on convertible aircraft and shrouded propeller vehicles was reviewed last month at the Fourth

(*Turn to page* 132, *please*)

BURTON Engineered SPRINGS



Across the board applications

—for trucks, trailers, motor cars and off-highway equipment . . . Burton Springs support the rolling stock of the nation.

Burton engineering

—keyed to the ever-changing needs of the industry—combines the time-tested advantages of steel springs with newest developments in their design and manufacture for top performance.

Leading truck manufacturers

. . . Mack, White, Dodge, Diamond T, Trailmobile, Lufkin, Dart, Nabors, Autocar and others . . . have long specified Burton Leaf or Coil Springs as original equipment.

Production Facilities

—Burton Springs are produced under the most rigid standards of quality, utilizing modern equipment and scientifically controlled methods.

★ Proven in actual service . . . proven under the toughest conditions of high speed, rough roads and heavy loading . . . BURTON Engineered Springs are equal to the most requiring tasks.

By controlling lateral and longitudinal "play," sidesway and rocking, as well as softening and controlling vertical motion, they provide stability and added life to the entire vehicle control.

You can be sure of the finest quality and dependability when your rolling stock is equipped with time-proven springs.

BURTON AUTO SPRING CORP.

. . . Vital Support for the Automotive Industry . . .

WESTERN AVENUE AT FORTY-EIGHTH STREET • CHICAGO 32, ILLINOIS

The BUSINESS PULSE

Expansive Tendencies Predominate in the Economy with No Serious Downward Push in Sight. Gross National Product Rate of $475-480 Billion — in Terms of Present Prices — Foreseen for End of 1959

As the new year begins, there are good grounds for optimism. The trend of business is upward, and from all appearances the economy is still in the relatively early stages of the recovery movement.

Gross national product in the fourth quarter of 1958 approximated $452 billion, or $13 billion more than in the previous three-month period. At this level, GNP in real terms was in all probability very close to the pre-recession peak.

The most important fact to be taken into account at the beginning of the new year is that 1958 was to a large extent a period marked by the correction of economic distortions. Inventory positions were digested and consolidated. A respite was experienced in business investment in plant and equipment, and consumers made progress in bringing debt positions into better alignment with incomes. These and other improvements augur well for 1959, just as the distortions created in 1955, 1956, and 1957 had a year ago augured ill for 1958.

The following review of major segments of the economy indicates the areas where strength may be expected in the coming year:

Comsumer Spending: Much of the credit for the brevity of the 1957-58 recession must go to the American consumer. His purchases were well maintained, even when business news was at its worst. And after the first quarter of 1958, rising outlays by consumers for both nondurable goods and services contributed importantly to the recovery movement.

This Survey, published for the readers of automotive magazines exclusively in AUTOMOTIVE INDUSTRIES, has been prepared by the Guaranty Trust Company of New York

Basic conditions now favor a further rise in consumer spending, and this is the principal reason for optimism with respect to 1959. The most important factor underlying this outlook is the rising trend of disposable income. Also significant is the fact that there has been no rise in consumer debt during the past year, but on the contrary some moderate decline. Automobile demand still needs to be tested, but with incomes rising and unemployment declining, there is certainly a strong probability of at least some improvement in new-car sales over 1958's depressed levels.

It seems entirely possible that personal consumption expenditures may be running $12 billion or $13 billion higher at the end of 1959 than at present. Actually, this could well prove a conservative anticipation.

Capital Spending: The decline in investment spending is over, from all appearances, and the pertinent question now is how soon an uptrend can be expected to develop. Since October there has been confirmation that the recovery movement is solidly grounded, and this has probably already produced some upgrading of investment plans. And past experience suggests that additional upgrading will take place during the course of 1959, if the business climate continues to improve. Given today's abundant capacity, no one can reasonably expect a vigorous expansion-type boom in the capital-goods area during the coming year. Yet the compelling, ever-present need on the part of corporations to improve efficiency could bring about a significant rise in modernization expenditures. Against this background, it would not be surprising if outlays for new plant and equipment by the end of 1959 should be running several billion dollars higher than at present.

Business Inventories: There is every indication that liquidation of inventories has virtually ceased, and the relationship between inventories and sales and between inventories and new orders now suggests that the economy is on the threshold of accumulation. Typically, recovery movements are characterized by additions to business stocks. By the end of 1959, accumulation could well be running at an annual rate of several billion dollars.

Government Outlays: In 1958 the uptrend which has characterized the entire postwar period persisted in spending by State and local government. All signs, moreover, point to a continued rise in 1959, and by the final quarter of the year the annual rate of expenditures could easily be running $3 billion higher than at present.

(*Turn to page* 134, *please*)



Sealed Power 3-piece Stainless Steel Oil Rings hold their fit in the cylinder for two reasons: new abutment design (see enlargement); and new material (Stainless Steel).

The new design is engineered with the correct number of balanced spring tension points to assure the greatest possible flexibility to the ring. When compressed in the cylinder, an equal number of sturdy shoulders supporting each steel rail produces instant conformity to the cylinder bore and constant uniform pressure.

Because Stainless Steel used in Sealed Power rings is not affected by engine operating temperature, the desired pressure can be built in *and maintained* throughout the life of the ring. The expander does not have to be overstressed to compensate for tension loss after the engine reaches operating temperature. This eliminates ring drag and excessive wear . . . results in longer life.



OTHER KEY FEATURES

- Stop oil consumption
- Stop smoking even under high vacuum operation
- Side-sealing
- Quick seating
- Chrome-plated for long life

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN • ST. JOHNS, MICHIGAN • ROCHESTER, INDIANA • STRATFORD, ONTARIO
DETROIT OFFICE • 7-236 GENERAL MOTORS BUILDING • PHONE TRINITY 1-3440

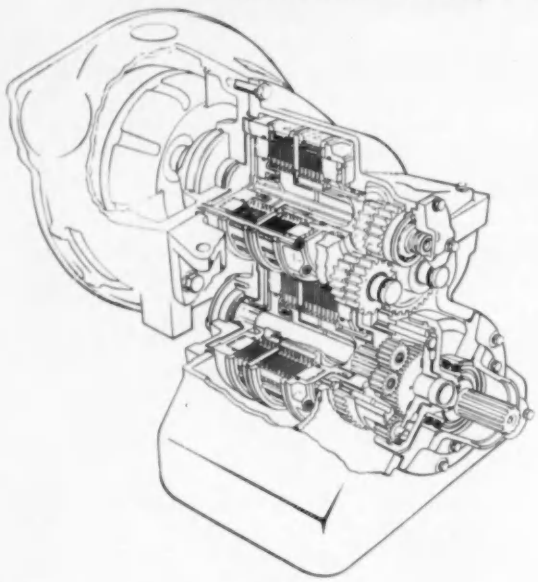
Sealed Power Piston Rings PISTONS CYLINDER SLEEVES

Leading Manufacturer of Automotive and Industrial Piston Rings Since 1911
Largest Producers of Sealing Rings for Automatic Transmissions and Power Steering Units

NEW PRODUCTS
AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Dual Range Power Shift Transmission



Hyster dual range power shift transmission. All engaging elements of the transmission automatically adjust to compensate for wear, providing consistent performance throughout the life of the truck. Other adjustments needed are made easily with tools normally at hand.

Hyster Co. has developed a dual range, power shift Hystamatic transmission as optional equipment for the Challenger 60, 70 and 80 pneumatic-tire lift trucks in the 6000 to 8000 lb capacity range.

It is a hydraulically shifted, constant mesh unit with an integral torque converter. Two ranges forward and two in reverse are operator selected by means of levers. All components are confined in a single housing mounted to the engine as an integral part of the power train.

Movement of the selection levers hydraulically shifts the transmission into forward or reverse, high or low range. The torque converter automatically adjusts power output to fit load and road conditions within each range. Action of the torque converter absorbs shock loads on shafts, bearings, gears and axles and extends truck life. Inching is controlled by the left foot with a combination inching and braking pedal, leaving the right foot free to maintain engine speed for fast lifting. The engine cannot be started until transmission is neutral.

Circle 30 on postcard for more data

Dial Indicators

Extra long measuring range is available with the addition of the model E81U to a line of dial indicators. Specially designed for use in measuring slide travel, cam throw, etc., this model has a total range of 3 in. and is graduated in 0.001 in.

The unit is equipped with two counter dials to enable quick reading anywhere in the total span of 30 revolutions. One is divided into 10 segments of 0.100 in. each to count individual revolutions. The other is divided in inches. *Federal Products Corp.*

Circle 31 on postcard for more data

Heavy Duty Oil

The Franklin Oil & Gas Co. has announced the development of Tuf Draw Compound No. 234, a type of drawing, drilling and tapping oil.

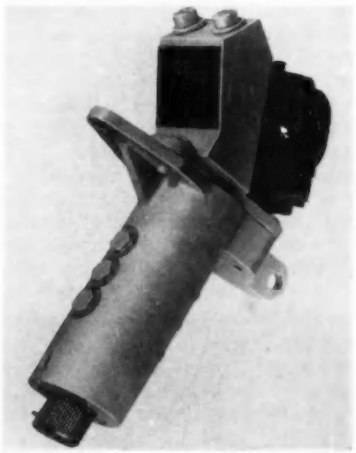
The oil has been used to draw automobile bumper guards, headlight assemblies, door hinges and other severe drawing and stamping jobs. Tuf Draw Compound 234 is a viscous, honey-colored liquid that contains no sulphur or other ingredients that corrode or stain metal parts. Also the finished parts can be cleaned with conventional cleaning equipment.

Circle 32 on postcard for more data

Damper-Actuator

The "Damperator," a dual purpose hydraulic device designed for installation on rudders and other control surfaces, has been announced by Houdaille Industries, Inc. Precise rotary-motion control is obtained through an electronic servo system. The servo valve is mounted directly on the unit to assure maximum efficiency from matched components, plus full consideration of fail safe features.

Uniform damping rates are provided throughout the temperature range of −65 to 160 F. Other features include automatic air bleeds



and pressurized fluid replenishing. *Houdaille Industries, Inc., Buffalo Hydraulics Div.*

Circle 33 on postcard for more data

Liquid Oxygen Cylinders

The LC-3 oxygen cylinder is a double-walled, insulated container capable of holding a large volume of oxygen in the liquid state. The quality of insulation is such that it takes several days before enough heat leaks through to boil off enough gas for any to escape through the relief valve. In normal usage, the cylinder is so designed that the gas pressure inside is always above the setting of the delivery regulator and below that of the relief valve so that no gas is lost.

There is a built-in heat exchanger that automatically vaporizes and warms as much gas as is needed to a maximum of 300 cu-ft an hour in intermittent service. Demands for more than this can be met by manifolding two or more LC-3's. *Linde Co., Div. of Union Carbide Corp.*

Circle 34 on postcard for more data

Stock Lifters

By drilling two holes and tapping one, builders of progressive dies can install ready-made stock lifters available from stock. The user has only to locate the unit, drill two holes and tap one for a retaining screw.

To install, he drops the lifter and its spring in one hole and secures it with the socket head retaining screw in the tapped hole. Replacement of a broken spring or lifter can be done in minutes without removing the die from the press. *Detroit Die Set Corp.*

Circle 35 on postcard for more data

Missile Vertical Gyro

Series 1080 vertical gyros are designed to provide reliable operation in severe shock and vibration environments such as those encountered



in missiles, drones and high-performance aircraft.

They utilize proven components of the Lear gyros designed for the F-5 and MB-2 autopilots. The erection system features two single - axis, gravity sensing electrolytic - type switches.

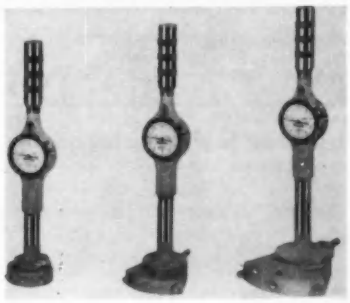
The flexible design of the 1080 allows the unit to be made into a directional or a free gyro as well as a vertical gyro. They have various slaving and erection rates in these three uses. Slaving rates up to 360 degrees per minute are available. *Lear, Inc.*

Circle 36 on postcard for more data

Dial Bore Gages

Designed for inspection as well as checking hole sizes during machining or grinding operations, these No. 84 series dial bore gages will measure bore diameter in ten-thousandths or half-thousandths, depending on the model chosen. They will indicate variations from true bore such as taper, out-of-round, bell mouth, hour glass or barrel shape.

They are available in six models to provide a choice of indicator readings in 0.0001 or 0.0005 in. Gaging contact, centralizing plungers and



range extension screws are normally hardened and tempered tool steel but carbide tips are available on special order. *The L. S. Starrett Co.*

Circle 37 on postcard for more data

Electric Eyes

ESS electric eyes are engineered to provide long maintenance free service. The miniature design allows them to be mounted in difficult places right on the production line. They are being used to solve many problems in automation and process industries.

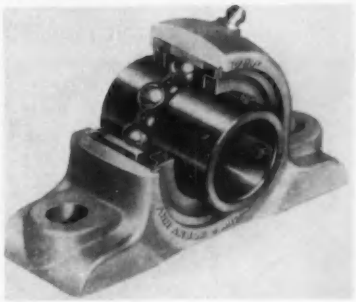
They offer practical approaches to monitoring, counting, or positioning of objects passing or dropping through a light beam. The pickup units measure 1½ by 1 5/16 by 11/16 in. and are provided with a ¼ in. pipe for mounting. *ESS Instrument Co.*

Circle 38 on postcard for more data

Pillow Block Bearings

Pillow block bearings with durable housings of ductile material that resist shock and vibration have been announced by Hoover Ball and Bearing Co.

These bearings — together with companion flange bearings, also with



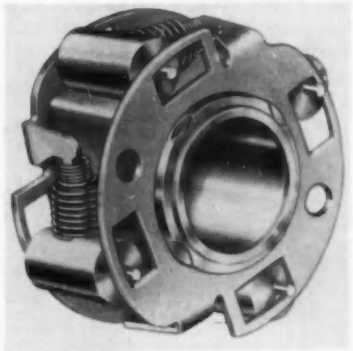
ductile housings — are designed to meet the need for low-cost, quality-made units to carry light loads at normal speeds.

Circle 39 on postcard for more data

Miniature Clutches

Miniature one-way precision roller clutches, that allow drive in one direction and provide free-wheeling action in the opposite direction are available from The Miniclutch Co.

The units meet requirements in designs involving near-zero backlash,



free-wheeling, selective coupling, automatic cycling, dual or multiple drives and adjustable ratchets.

Stock roller assembly sizes from 0.1875 in. bore and 0.625 in. OD through 0.625 in. bore and 1.625 in. OD. Complete clutch dimensions range from 0.250 in. shaft with 0.8125 in. housing through 0.375 shaft with 1.3125 in. housings. Right or left hand drives are offered.

Circle 40 on postcard for more data

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

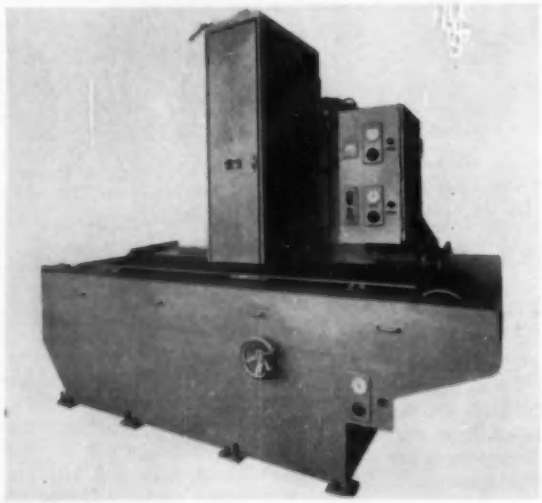
Lift Truck Has 7000 Lb Load Capacity



Towmotor Model 540 has 7000 lb load capacity and is equipped with TowmoTorque Drive for smooth starts and less driver fatigue. (Towmotor Corp.)

Circle 60 on postcard for more data

Flat Sheet Grinder With Single or Multiple Heads



Engelberg W-B series wide-belt flat sheet grinder has dynamically balanced contact and idler rolls mounted on precision antifriction bearings

ENGELBERG conveyor-type models will belt-grind flat stock to fine, micro-inch finishes, at continuous through feed rates of from 10 to 60 fpm. The single-head model shown, with 25 hp totally enclosed fan-cooled belt-drive motor, will accommodate sheet stock up to 22 in. wide, any length. Standard workpiece height capacity is 6 in.

Features of these wet-or-dry wide-belt flat sheet grinders include: pneumatic tensioning of abrasive and conveyor belts; automatic tracking of abrasive belt; a safety interlock mechanism which prevents operation in the event of insufficient air pressure or belt breakage and micrometer adjustment of grinding heads. *Engelberg, Inc.*

Circle 61 on postcard for more data

Trunnion Mounted Units

A LINE of adjustable trunnion mounted heavy-duty air and hydraulic cylinders, featuring positive adjustment and a one-piece trunnion, is built to major automotive manufacturer's and JIC standards, with pressure ratings of 200 psi (air) and 1000 psi (hydraulic).

Nine bore sizes are available. All models are offered non-cushioned, cushioned blind end, cushioned rod end or cushioned both ends; in five styles. Cushion check and adjustment are interchangeable. Mounting dimensions of cushioned and noncushioned cylinders are identical.

Piston and cartridge-retained rod seals are designed for operation at temperatures ranging from —20 to 150 F. Special seals for higher or lower temperatures and piston ring construction, for hydraulic cylinders only, are optional. *The S-P Mfg. Corp.*

Circle 62 on postcard for more data

Portable Grinder



Grinding the concave portion of a casting is being done here with a straight-handled horizontal grinder developed by Thomas C. Wilson, Inc. In this application the grinder is used with a three-inch cone wheel.

Circle 63 on postcard for more data

Automatic Transfer Unit

AN automatic, double-end transfer machine that can perform up to six metal forming operations at high production rates on each end of tubular or solid round stock has been announced by Walter P. Hill, Inc.

It will handle stock up to two inches diameter and will cycle at a maximum rate of 3600 pieces per hour. Stock is fed to the machine conveyor from a magazine or factory conveyor, carried through the machining or forming stations by the transfer mechanism and deposited on either exit conveyor or tote box in a completely automatic process.

Circle 64 on postcard for more data

Steel Lockers

A LINE of 2-person steel lockers for use in industrial plants save space by providing full-height compartments for two persons in the same area required for one large individual locker.

Standard equipment includes: coat hooks, coat hanger rods on lockers 18 in. or more in depth, number plate for each door, six ventilating louvers on top and bottom of coat compartment doors and three louvers in each hat compartment door.

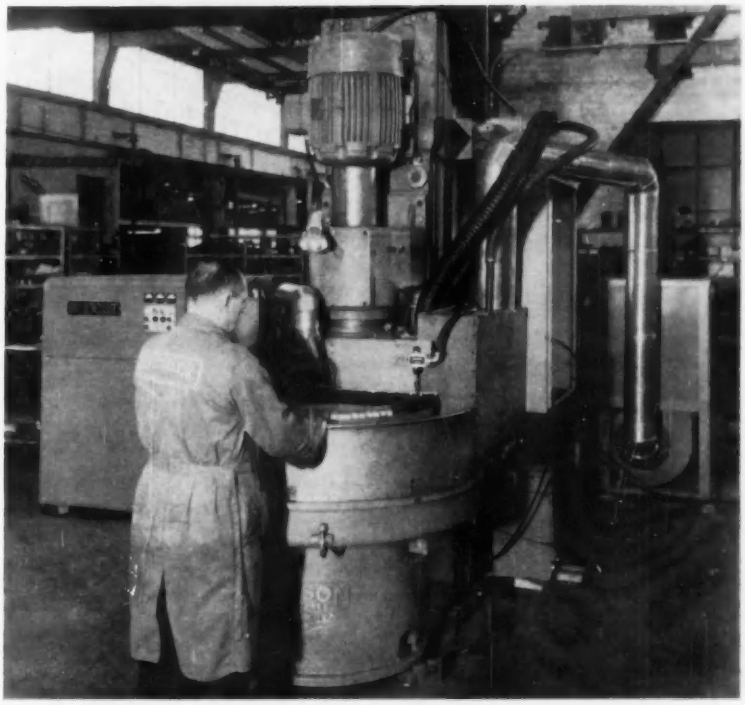
Coat compartment doors engage the frame at three points and are equipped with an automatic prelocking device that permits the door



Penco 2-person steel locker

to be locked while open, then closed without unlocking. Each lower door controls one hat compartment door by an interlocking device, eliminating the need for additional locks. *Penco Div., Alan Wood Steel Co.*

Circle 65 on postcard for more data



Mattison vertical-spindle electrolytic grinder has 100 gal coolant capacity

Electrolytic Production Grinder for Carbide Tools

DEVELOPMENT of a vertical-spindle electrolytic grinder capable of high production with minimum wheel wear in the grinding of brazed-type carbide tools has been announced by Mattison Machine Works. The machine uses a 1500 amp "Anocut" unit to supply the current required for the grinding process.

Surface finishes up to six microinches are obtained while taking off up to 0.012 in. of tungsten carbide in a single pass. Because there is no actual contact between the wheel and workpiece, wheel wear is reduced.

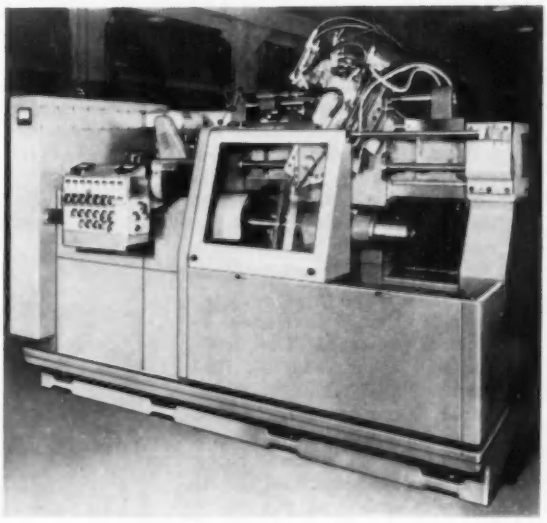
The worktable has a speed range of 1.7 to 12 rph.

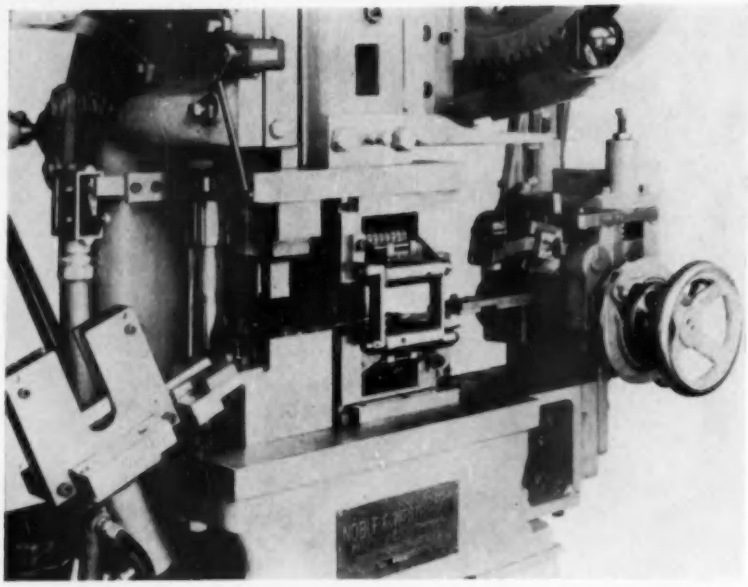
Circle 66 on postcard for more data

Single Spindle Fully Automatic Tracer Lathe

This Model 30 tracer lathe, combined with a choice of machine components, meets a wide range of specific turning requirements. It can accommodate one or two tracing units. One performs a single tracing cut in a fully automatic cycle, while the other unit provides two fully automatic tracing cuts with an indexing tool holder. Both units provide feed change during cut. (Jones & Lamson Machine Co.)

Circle 67 on postcard for more data





Noble & Westbrook Model 507 makes embossed identification tags automatically

Marking Press Produces Up to 3000 Tags per Hour

THIS machine makes embossed identification tags from brass wire stock in any predetermined quantities at production speeds up to 3000 per hour.

Built around a standard 10-ton back geared press with roll feed, this Model 507 has special tooling consisting of a multi-station die set including male and female embossing head which stamps a raised or formed impression in the tag. An automatic embossing head advances consecutively with each stroke of the press.

The press is furnished complete with motor drive, starter and solenoid operating valve for pneumatic stacker; combination air control unit consisting of filter, regulator, lubricator; a predetermining counter and special control circuit, making it possible to run off a given amount of tags. *Noble & Westbrook Mfg. Co.*

Circle 68 on postcard for more data

Rubber Cement

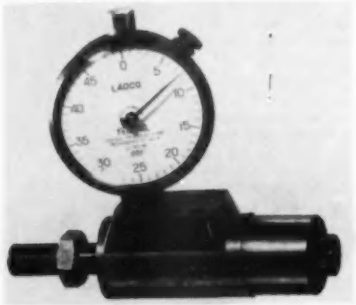
MADE by the Connecticut Hard Rubber Co., C-139 is a room temperature vulcanizing silicone rubber cement which can be used to bond silicone rubber to silicone rubber or to metal, the latter with the aid of C-230 metal primer. C-139 RTV is a two part material consisting of a low-temperature, flexible, high tensile, high tear strength silicone rubber solution containing about 35 to 40 per cent solids, and a non-volatile room temperature vulcanizing catalyst in solvent.

The bonds attained have good low temperature resistance. The brittle point is well below —100 F. High temperature limit is about 350 F with well cured silicone rubber. The material was designed to provide a seal patch system for silicone rubber coated diaphragm seals.

Circle 69 on postcard for more data

Indicator Stop Gage

THE Ladco stop gage, for locating the universal carriage of turret lathes, makes it possible to hold close face-to-face dimensions, neck-to-neck dimensions or any dimension that requires longitudinal positioning of tooling mounted on the cross slides. The gage screws directly into the stop rod in place of the master stop screw. It does not in any way limit the use of all the adjustable screws in the stop spool, should they be needed.



Ladco Gage increases accuracy of lathes

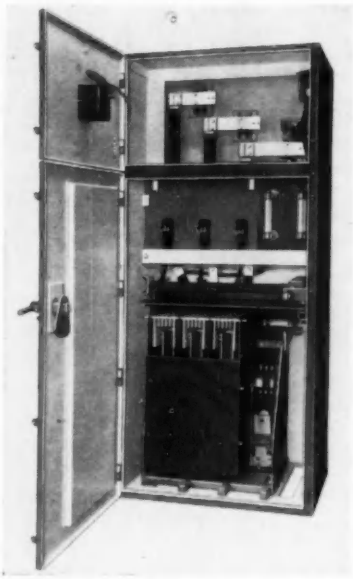
The dial indicator is protected from damage when the carriage is accidentally bumped into the stop rod, because the spring retainer comes into solid contact with the body of the gage stop at the end of the allowed travel. The amount of travel the stop registers on the indicator is 0.035 to 0.045 in. and longitudinal tolerances of plus 0.0005 and minus 0.0005 in. are easily maintained. *Lad Gage Co.*

Circle 70 on postcard for more data

High Voltage Starter

CERTIFIED interrupting capacity of a new starter which gives fuseless fault protection on high voltage motor drives is 100,000 kva at 2400 v, 150,000 kva at 4800 v.

For simplified inspection and maintenance, the phase barrier and arc-chutes of the ZHA starter draw out horizontally, making front and rear contact tips readily accessible. No roll-out is needed. A 3-way door-latch, interlocked between the disconnect and contactor interlocking system, provides positive personnel safety. The disconnect is gang-operated. When the door is open, disconnect blades are visible in the open and grounded position. *The Electric Controller & Mfg. Co., Div. of Square D Co.*



EC&M fuseless high voltage starter

Circle 71 on postcard for more data

(*Turn to page 87, please*)



There is no substitute for stainless steel
in automobiles

No other material is as bright, strong and resistant to rust and wear as Stainless Steel. It gives every car the clean, exciting beauty that sells in the showroom and re-sells on the used car lot. Look for *Stainless Steel* on your new automobile.

Specify McLouth high quality sheet and strip Stainless Steel. McLouth Steel Corporation, Detroit 17, Michigan.

McLOUTH STAINLESS STEEL



Kelsey-Hayes helps keep the goods on the move

The cargoes of commerce roll on wheels by Kelsey-Hayes—*pioneer producers of precision parts for the rugged vehicles of motor transport.* Fifty years of accumulated skills and experience uniquely equip Kelsey-Hayes as a supplier to the builders of commercial motorized equipment. Facilities unexcelled for mass production of wheels, brakes, hubs and brake drums, power brakes, transmission bands and custom quality metal stampings. Kelsey-Hayes Company, Detroit 32, Michigan.

KELSEY-HAYES

Automotive, Aviation and Agricultural Parts • Hand Tools for Industry and Home

18 PLANTS: Detroit and Jackson, Mich.; Los Angeles; McKeesport, Pa.; Springfield, Ohio (Speco Division); New Hartford, N. Y. (Metals Division); Utica, N. Y. (Utica Drop Forge & Tool Division); Davenport, Iowa (French and Hecht Division); Philadelphia (Heintz Division); Clark, N. J. (New Jersey Division); Windsor, Ontario, Canada.

Circle 143 on Inquiry Card for more data

Fluid Regulators

A LINE of small circulating fluid regulators for spray painting systems has been designed to solve the problem of attempting circulation at any available pressure. They assure positive pressure at the spray gun. Finish pressure is not affected by circulating pressure.

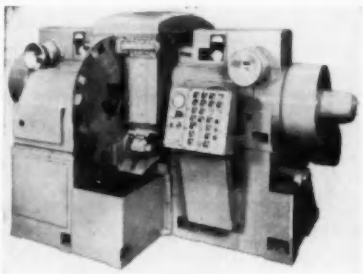
When attached to spray guns, they provide positive fluid pressure control at each gun individually, regardless of how many guns may be operating from a common pressure tank or circulating system.

The regulators are available with a single or double inlet for circulating or direct supply systems. *Binks Mfg. Co.*

Circle 72 on postcard for more data

Disk Grinder

THIS horizontal disk grinder, called the DH4, features push-button operation, accuracy to tenths, simple abrasive change, automatic dressing and sizing, centralized, one-shot lubrication, and many other advantages. Removed from the motor and other



Besly-Wells DH4 disk grinder

mechanisms for highly sensitive feed control, the spindle sleeves are cradled in the heads. They are moved by the feed screw, sliding on replaceable, lubricated ways with clearance adjustment provided. Precise disk and head adjustment is constantly maintained for consistent grinding accuracy. *Besly-Wells Corp.*

Circle 73 on postcard for more data

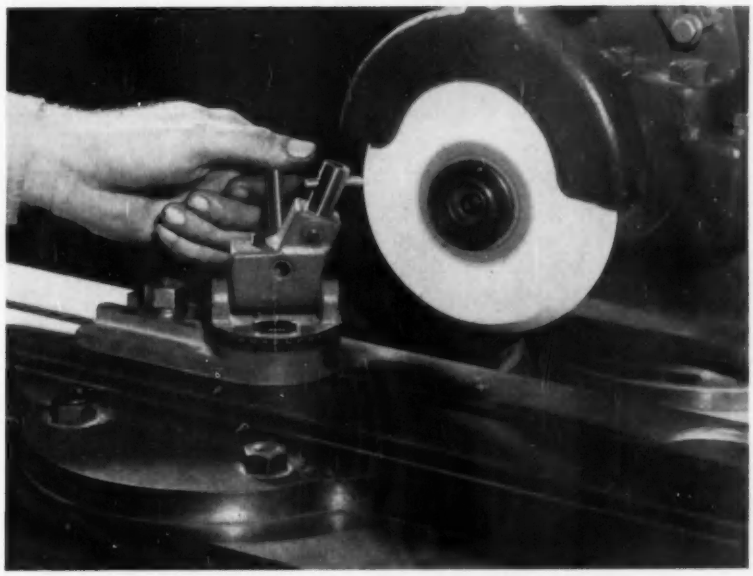
Frictionless Bearings

RUSLON bearings, made of fabric impregnated with Bakelite phenolic plastic, are said to eliminate the need for lubrication of bearings in mechanical applications ranging from miniature instruments to hydroelectric stations.

The major use for Ruslon bearings will be in the automotive field where knuckle and ball joints will function for the life of the car without lubrication and without appreciable wear.

The bearings employ both plastic and cotton yarns woven into fabric and then immersed in a solution of phenolic resin. They are inert to acids and alkalies and are not subject to electrolysis or corrosion by salt water. *Russel Mfg. Co.*

Circle 74 on postcard for more data



Steptool angle dresser eliminates sticky, jerky, or loose chattering motion

Versatile Angle Dresser Produces Fine Finishes

FOR use in tool and cutter grinding, form tools, cylindrical and surface grinding, this angle dresser obtains cutting action by rocking between centers. It can be left on the machine since it hinges down out of the way to prevent collision with the wheel.

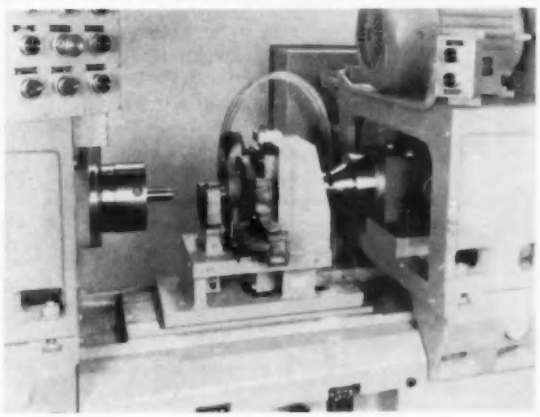
The dresser also locks in fixed position for dressing horizontally or under the wheel with the slide movements of the machine itself. A post carrying the diamond nib swivels the point in any direction and raises up and down to match the center-heights of any make of grinder, and permits grinding or sharpening above center. *The Steptool Corp.*

Circle 75 on postcard for more data

Standard Machine Bores Three-Step Contour

Water pump bodies requiring a 3-step inner contour—straight bore, recess and undercut—in one side of part are being machined with a single tool on a standard Style 1212-A precision boring machine. In addition, a boss on the opposite side of the part is plunge faced on this double-ended machine. Net production is 54 pieces per hour. (Ex-Cell-O Corp.)

Circle 76 on postcard for more data



(*Continued from page* 72)

shapes which might ordinarily be made in huge presses, explosive force is also being considered for such diverse tasks as surface hardening of steel, riveting, hole piercing, embossing, compacting of metal powders, forging, bonding, and casting under pressure.

The extended use of parts made by powder metallurgy methods is likely to result from a new low-alloy iron powder with a tensile strength of 110,000 psi after heat treatment. The strength level can be increased to 180,000 to 190,000 psi in the heat-treated condition by annealing, repressing and sintering.

At the lower strength level, parts made of the new powders exhibit good ductility. In general, parts made from the powders compare favorably in mechanical properties with similar parts made of wrought mild steels. Source of the iron powder is roll scale from steel mill rolling facilities.

In another development, metal strip is produced directly from metal powders. Early work in this field has centered about copper and nickel powders. In producing strip, the powder is fed from a hopper into a carefully controlled gap between the turning rolls of a "compacting mill." After leaving the turning rolls, the compacted powder goes through a furnace for sintering, after which it is hot rolled and coiled. Strip metals have been successfully rolled in thicknesses of 0.050 to 0.060 in. and in widths up to 11 in. at a rate of six fpm. Properties of copper strip made in this manner are said to equal those of conventional electrolytic copper strip.

Many non-ferrous metals continue to be studied intensively by metallurgists and metals engineers. Included in the studies are titanium, zirconium, beryllium, columbium, tungsten, molybdenum, and vanadium. Metals in the non-ferrous group are expected to provide such properties as light weight (low density) or better heat and corrosion resistance.

The problems are common to many of these metals. First, they are usually difficult to reduce to the pure state. Second, there is much work to be done in providing the metals in a ductile condition. Pure metals are needed to determine properties accurately, and ductility is necessary to permit fabrication and avoid brittle fracture in service.

Considerable progress has been made in securing pure metals through the use of a technique known as electron beam vacuum melting. In using the process, ingot, flake, sponge, powder, or sintered bars of the metal are fed into a vacuum chamber where the raw material is melted by means of a beam from an electron gun. A similar beam keeps a molten pool of metal at the surface of an ingot which is slowly withdrawn from

(*Turn to page* 91, *please*)



"PONY POWER" MOTORS

that give stamina to your products

Lamb Electric ***fractional*** horsepower motors, like the small horses of the famed western-pioneer-day Pony Express, are developed for *stamina.*

Their dependability, and efficiency (optimum weight-size-horsepower ratio) are qualities that result from proper design and careful manufacture by personnel with many years of experience in the small motor field.

May we demonstrate how Lamb Electric Motors can bring these advantages—and also perhaps lower costs—to *your* products?

THE LAMB ELECTRIC COMPANY • KENT, OHIO
A Division of American Machine and Metals, Inc.
In Canada: Lamb Electric — Division of Sangamo Company Ltd. — Leaside, Ontario

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS



Radar voltage regulator gear motor. A rugged high-torque, high-speed motor. Motor with efficient spur gear speed reducer.

100% MECHANICAL MACHINE
DRILLS - TAPS - REAMS . . .
a machinist's DREAM!!

A REALLY NEW MACHINE

THAT –

CUTS INDIRECT MAINTENANCE COSTS —
Your own mechanics maintain unit.

HAS NO COSTLY HYDRAULIC FLUIDS —
No troublesome leaks to locate.

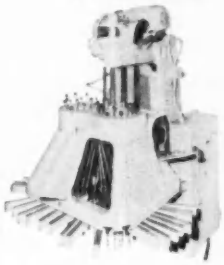
INSURES STEADY, POSITIVE FEED —
Insures greater tool life.

ELIMINATES SURGE —
Even on breakthru. No tool breakage.

3 DIFFERENT CYCLES —
Completely automatic for high production.
Semi-Automatic for low production.
Jog cycle for set-up work.

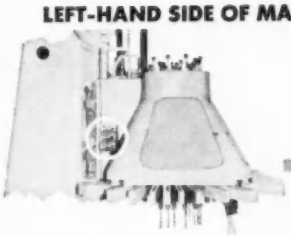


TOP OF HEAD



Two Independent Spindle Speeds and Neutral position on each Spindle controlled by knobs.

LEFT-HAND SIDE OF MACHINE



Control for Drilling & Tapping Cycle.

SPECIFICATIONS:

Heavily ribbed cast iron base has large coolant trough. Cast iron column is ribbed, and accurately machined ways scraped for perfect head alignment.

27" x 40" Rectangular Head, bored for (32) 1½" diam. spindles, with two (2) independent spindle speeds, and neutral position for each spindle when not in use. Spindle speed variable from .005 per rev. low, to .090 per rev. high, with speed range from 130 RPM to 1050 RPM. Feed is thru ball screw with minimum friction from spindle drives. Rapid head traverse accomplished with 1 HP. Motor. Electric brake holds lead-screw and shuts off motor when head goes from rapid traverse to feed stroke. Spindle drive rotates on a ball nut on locked lead-screw to give pre-set feed for tool. Spindles are slip-sleeve, adjustable arm type, used with master-bored cluster plate. 2 to 1 Spindle speed ratio.

Lubrication can be manual or automatic. Electric controls are J.I.C.

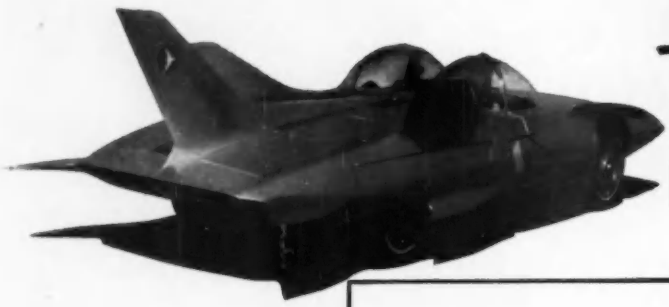
Motors:

1-20 HP 1800 RPM for spindle drive
1- 1 HP 900 RPM for rapid traverse.

Floor space 88" x 56". Weight 18000 lbs.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

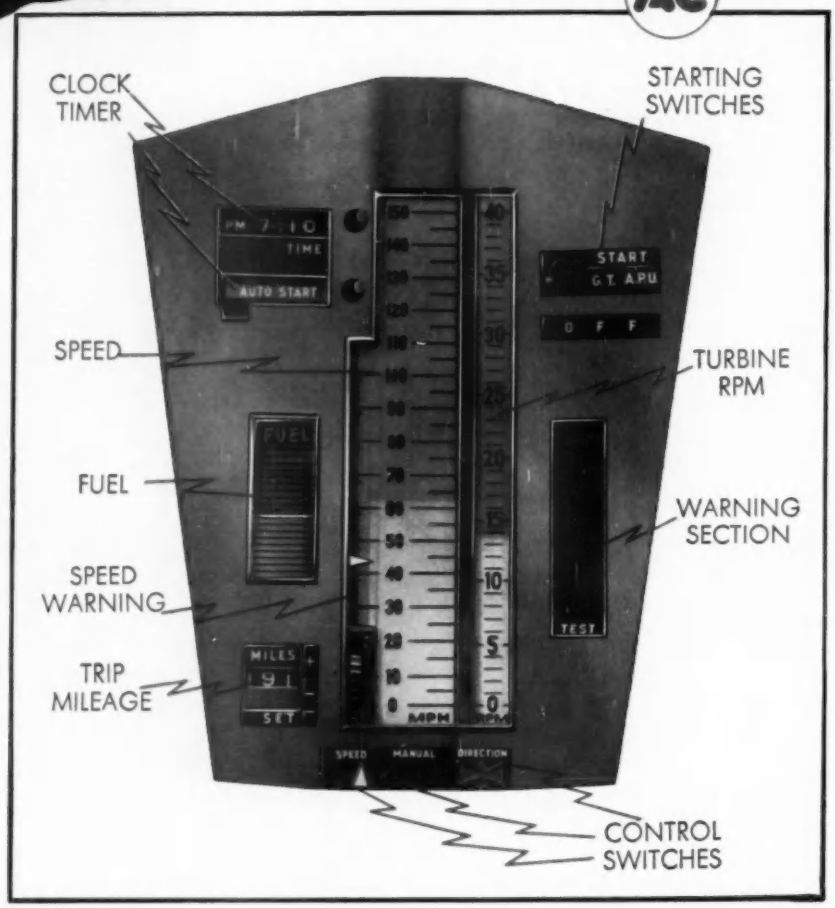
GM Firebird's ELECTRONIC BRAIN BY AC





"These instruments for the first time make effective use of electronic techniques in an automotive instrument panel."

J. A. ANDERSON
VICE PRESIDENT, General Motors Corporation
GENERAL MANAGER, AC Spark Plug Division



"We think the industry will find these devices interesting and challenging!," Anderson says. "In addition to reporting such normal operating conditions as speed, fuel supply, mileage travelled and turbine RPM, a WARNING SECTION also lights up to notify the driver of possible malfunction in one or more of 13 other areas. When the WARNING SECTION is dark, the driver knows the car is functioning perfectly. Though futuristic in its concepts, the Firebird III Instrumentation is just one more example of AC Engineering Creativity available to you by contacting any AC Office."

AC

QUALITY PRODUCTS

FLINT—1300 North Dort Highway, CEdar 4-5611
CHICAGO—7074 North Western Avenue, Rogers Park 4-9600
DETROIT—General Motors Building, TRinity 5-2630

Watch Walt Disney Studios' ZORRO every week on ABC-TV

AC SPARK PLUG ⚛ THE ELECTRONICS DIVISION OF GENERAL MOTORS

Circle 145 on Inquiry Card for more data

(*Continued from page* 88)

the heating area as the bottom solidifies. Purification of metal is achieved through the vaporization of oxides, gases, and other unwanted materials. Highly efficient vacuum pumps pull the vaporized impurities out of the system.

Columbium is now being melted on a semi-commercial scale by the electron beam method and is being purified to a higher degree than had been possible previously. For example, oxygen in the metal is reduced to about 100 parts per million. The method is also expected to find application in production of ultra-pure tantalum, molybdenum, beryllium and special steels and stainless alloys.

Beryllium has long been recognized as an ideal metal to meet many of the demands of space travel. However, the properties, including high strength and low density, cannot be utilized until the metal becomes available in ductile sheet form. Attempts to roll beryllium sheet have met with some success, and samples are being tested by airframe and missile manufacturers. Sheet produced has an ultimate tensile strength of from 80,000 to 104,000 psi.

Molybdenum, another metal that has a promising future in space vehicles, is now being used in some production parts. New fabricating techniques are required in working with molybdenum primarily because it is likely to be brittle at room temperature. Some heat is required for most operations. Welding, which involves extremely high temperatures for melting electrodes, requires extremely careful control over all steps to prevent burning through the base metal.

Interest in titanium has been revived by the introduction of three new alloys. The most important of these is an all-beta alloy which can be heat-treated to a tensile strength of 240,000 psi. The alloy is also credited with having the best formability of any titanium-base material. The combination of strength and formability is expected to put again titanium into a prominent position as an aircraft and missile material.

As more refractory materials are used in industry the more difficult becomes the problem of machining and finishing parts made of them. Thus, considerable interest has been aroused by a process called "chemical drilling." The method can be used to create the effects of drilling or machining. In shaping a piece, low voltage electricity is passed through an electrolyte such as hydrochloric, sulfuric, phosphoric, or hydrofluoric acid to erode the metal. Various methods can be used to guide the path of the electrolyte to produce the desired shape.

There is a constant demand for improved quality in steels and other alloys. One method of increasing quality and obtaining more uniformity in these materials is being achieved by melting in vacuum furnaces and pouring in molds protected by vacuums. Although other reactions are involved, the principal function of vacuum treatments is to remove gases and inclusions which prove harmful if allowed to remain in the metals.

Ordinary steels are being used in applications where once they were excluded or at best served for only short periods of time. Added life through resistance to heat and corrosion is provided by coatings such as ceramics and aluminum. An example is the extensive use of aluminum-coated steels for mufflers and other parts of 1959 automobiles.

RUBBER THE rubber manufacturing industry looks forward to a 13 per cent gain in rubber consumption in 1959, according to Ross R. Ormsby, president of the Rubber Manufacturers Association. While 1958 figures are not all in, indications are that consumption totaled about 1.33 million long tons, as compared with the 1.50 million long ton figure estimated for 1959.

Manufacturers of consumer-type rubber products generally did

(*Turn to page* 96, *please*)



IN FASTENERS SOUTHERN IS progress

Southern Screw Company specializes in progress—through the manufacture of finer fasteners at less cost . . . If you have a production problem that can be solved by Southern Screw's quality, speed, or service, let Southern fasteners show you the way toward a profitable solution. Southern specializes in screws AND progress — and progress invariably includes profit for our customers!

Address: Southern Screw Co., P. O. Box 1360, Statesville, North Carolina.

A, B, C, & F Tapping Screws — Wood Screws
Machine Screws & Nuts — Dowel Screws
Carriage Bolts — Hanger Bolts
Stove Bolts — Wood & Type U Drive Screws

WAREHOUSES:
New York • Dallas • Chicago • Los Angeles

Southern SCREW COMPANY LOS ANGELES · CALIFORNIA

Circle 146 on Inquiry Card for more data

3 GOOD REASONS WHY YOU SHOULD

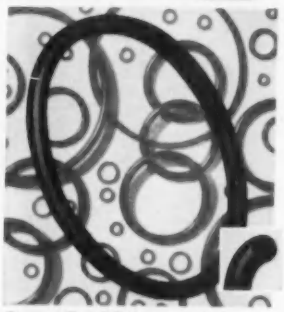
Go Goshen

for NEW standards of precision and performance



TETRASEALS

. . . rectangular-section rings that give high performance, low-cost sealing for most static and some moving applications. Interchangeable with standard o-rings . . . need no special tooling. A Goshen exclusive.



O-RINGS

. . . precision molded from wide range of compounds, to meet today's ever-toughening conditions. Available in a complete range of AN, MS, SAE and JIC standard sizes, plus non-standard sizes and special shapes.



CUSTOM-MADE PARTS

. . . such as bellows, bushings, diaphragms, gaskets, grommets and others, are precision-fabricated to meet strictest requirements, as to compound, service life and operating satisfaction. These parts are not stocked, but produced promptly on order.

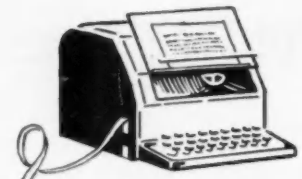
Whenever you have a seal or rubber part problem, Go Goshen for the solution.

Send for Literature

☐ TETRASEALS ☐ GORLUBE (Low Friction Treatment)
☐ O-RINGS ☐ GROMMETS

Goshen Rubber Co., INC.

2719 S. TENTH ST. GOSHEN, INDIANA



ON OUR WASHINGTON WIRE

The new Congress can be summed up this way: Democrats have the votes to get about any kind of law they wish. Only possible restraint: Not enough votes to override a White House veto. On principal issues, here's what to expect:

Spending to Rise — Government spending is to rise, despite the lower amounts proposed by President Eisenhower. Congressional leaders see in the November, 1958, elections a "mandate" from the voters to spend more, not less. Total is likely to be closer to $79 billion than to the $77 billion Ike suggests.

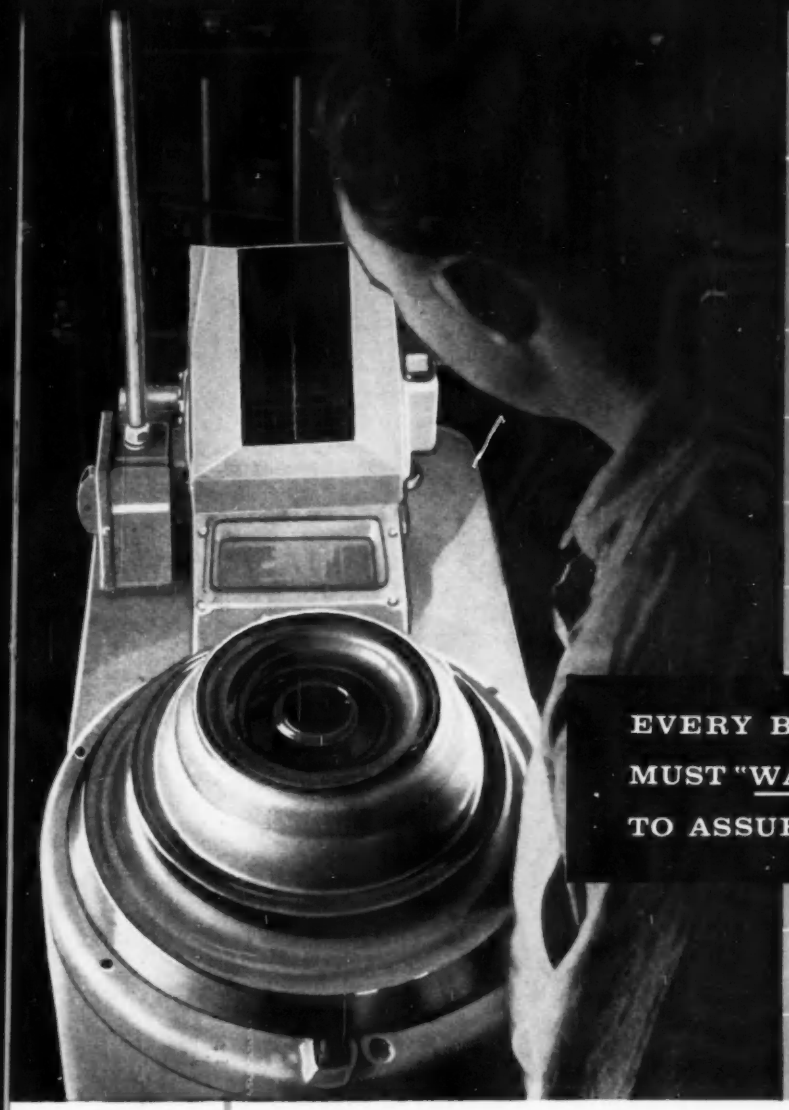
Some Taxes to Rise—Social security deductions went up on Jan. 1 from 2¼ to 2½ per cent. Insurance companies will pay higher taxes. Proposals for higher postal rates and gasoline taxes are finding a chilly reception on both sides of the political aisles. Certain taxes scheduled for automatic cuts on June 30—such as those on corporate income. automobiles, liquor, and tobacco—are likely to be continued at existing rates.

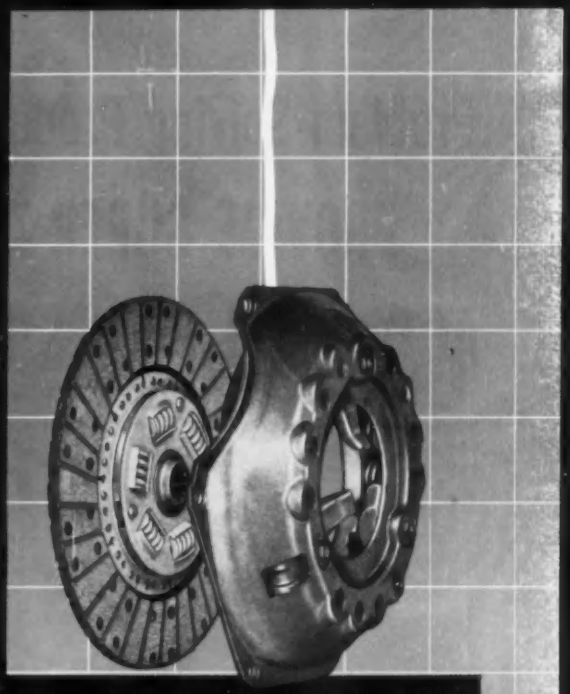
Depreciation to Get New Study — Depreciation laws will be examined closely by taxwriting House Ways and Means Committee, but it's doubtful if any realistic new depreciation laws will be voted this year.

Defense Spending Up Again—Defense spending has been rising by an average $1 billion a year since the Eisenhower Administration took office seven years ago. Modern weapons are more costly. Inflation is driving up the cost of metals and other component materials. No reversal of the trend is in sight.

Not Much Labor Reform—Both Sens. McNamara, D., Mich., and John F. Kennedy, D., Mass., are urging approval of a mild labor reform bill along the lines of last year's Kennedy-Ives bill. This kind of labor reform meets with union approval and thus has a better-than-even chance of passing this year. In fact, it's an open secret in Washington that labor lobbyists wrote most of the Kennedy-Ives bill. Senator Kennedy has asked his union friends to prepare for him a new bill along the same lines.

Government officials believe the real reason for the visit to the U.S. of Anastas Mikoyan (top USSR foreign trade official) is to arrange barter or trade deals for equipment to build up the Russian chemical industries. High USSR officials have stressed publicly in recent months that they intend to put their chemical industries in the top world position.





EVERY BORG & BECK CLUTCH MUST "WALK A STRAIGHT LINE" TO ASSURE PERFECT BALANCE

Probably the most important single quality in a clutch is *balance*—because balance means smoothness of operation, not only of the clutch but of the engine as well.

That's why Borg & Beck clutches are checked for balance, at operational speeds, on specially designed test machines. Even the slightest unbalance is instantly detected and carefully corrected. Perfect balance is assured, as shown above, when the electric beam of the oscillograph is vertically straight on the calibrated screen. And every Borg & Beck clutch must "walk this straight line" before it passes inspection.

This is typical of the extra care that goes into every step in the making of Borg & Beck clutches. It is your assurance of top quality, top performance, top value.

BORG & BECK®

THE AUTOMOTIVE STANDARD FOR MORE THAN 40 YEARS

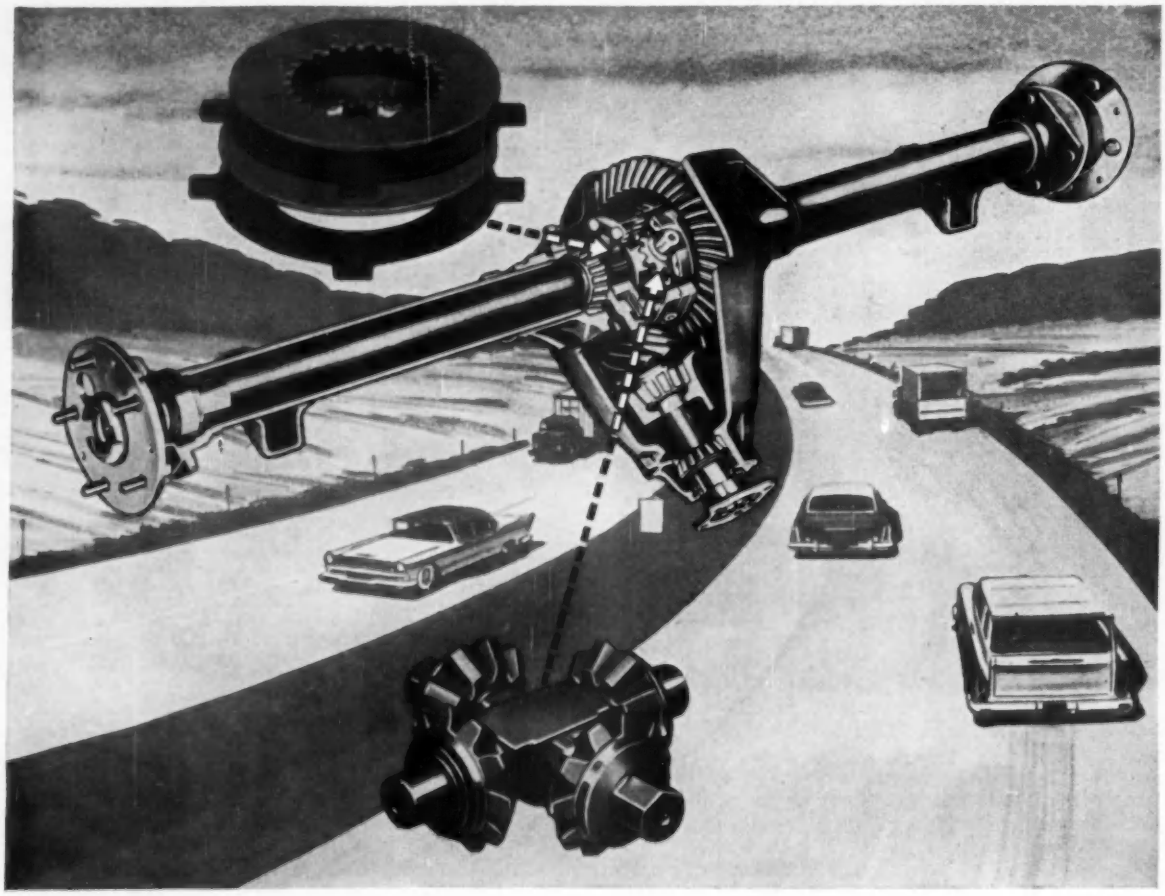
BORG & BECK DIVISION, BORG-WARNER CORPORATION, CHICAGO 38, ILLINOIS

Export Sales: Borg-Warner International, 36 S. Wabash, Chicago 3

Circle 143 on Inquiry Card for more data

Problem-Solving Products from Republic

PROVIDE SUPER TOUGHNESS AND STRENGTH AT CRITICAL POINTS IN AUTOMOTIVE DIFFERENTIALS



Modern passenger cars with increasing horsepower present problems in high speed stability and handling. The Powr-Lok differential, developed by the Dana Corporation, Toledo, Ohio, permits an automotive axle to transmit the greatest driving force to the rear wheel having the better traction.

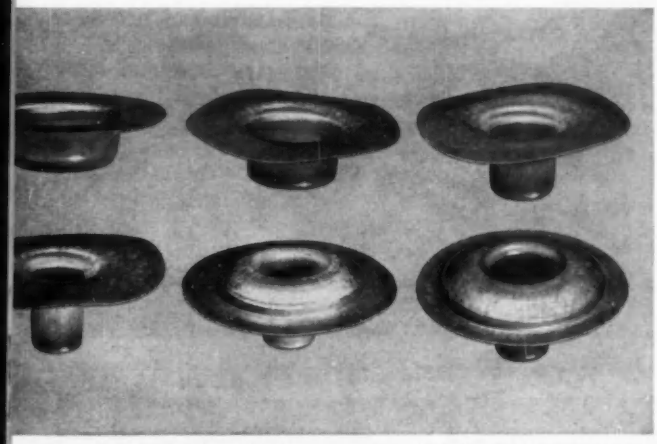
Essential to the economical and dependable operation of these differentials are Republic Alloy Steels. Why? Because only alloy steels have the high strength, toughness, shock-resistance, and abrasion-resistance needed to withstand the severe service to which differential clutch rings and side gears are subjected.

By specifying Republic Hot Rolled 8615 Alloy Bars, Dana engineers have reduced the possibility of a mechanical breakdown to an absolute minimum.

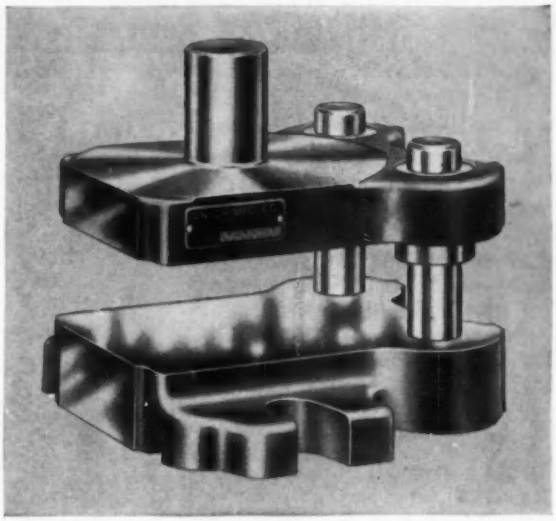
These fine steels offer superior toughness and strength to withstand torque, fatigue, shock, and stress. Alloy steel's uniform response to heat treatment gives these rings and gears hard surfaces around tough cores providing maximum resistance to abrasion, friction, and wear.

In Republic Alloy Steels you will find highest strength values—plus an exceptionally high strength-to-weight ratio that permits the designing of thinner sections to save weight and hold down size without any sacrifice of needed strength.

Republic's 3-Phase Metallurgical Service—field, mill, and laboratory—is always available to help you apply these quality alloy steels to your product. It's confidential. There's no obligation. Send coupon for more information.



HERE ARE SIX STEPS of possibly the severest manufacturing torture that a galvanized steel sheet can take. In its final form, it becomes the end piece of a muffler manufactured by the Mackenzie Muffler Company, Inc., Youngstown, Ohio. It is made out of Republic Continuous Galvanized Sheets. Despite the many deep drawing operations, the coating does not crack, flake, or peel. Republic Galvanized Sheets can do a profitable job for you. Clip the coupon and mail it in for more information.



REPUBLIC CHATEAUGAY PIG IRON meets demands for both strength and accurate machining in die sets manufactured by the Union Manufacturing Company, New Britain, Connecticut. As a result, Union has standardized on Chateaugay, low phosphorus, copper-free pig iron for maximum strength, flaw-free, easy-to-machine castings. Other superior characteristics of Chateaugay include its exceptional fluidity, even cooling, and fine dense grain structure. For complete information mail coupon.



REPUBLIC'S NEW HIGH STRENGTH POWDER, TYPE H. S. 6460, opens the way to new markets for new applications using sinterings for highly stressed parts. Type H.S. 6460 can be used with existing operating equipment. It provides a minimum tensile strength of 60,000 psi at 6.4 density as sintered, and 100,000 psi heat treated. Type H.S. 6460 maintains its dimensional characteristics after sintering—less than .004 inches per inch shrinkage from die size at 6.4 density. Available in production quantities up to and including 12 tons, or in multiples thereof. Mail coupon for technical data sheet on Type H.S. 6460 Powder.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. AI-6440-A
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Have a metallurgist call.
☐ Alloy ☐ Pig Iron
☐ Metal Powder ☐ Titanium

Send more information on these Republic products:
☐ Alloy Steel ☐ Stainless Steel
☐ Type H.S. 6460 Powder ☐ Continuous Galvanized Sheets

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

(*Continued from page* 91)

well in 1958. Estimated shipments of 59.50 million replacement passenger car tires, for example, set a new record. However, the RMA spokesman said other segments of the industry felt the impact of the 1957-58 business setback. Notably, these included firms manufacturing original equipment automotive rubber products and industrial rubber products.

He said that the industry's recovery since April, 1958, had been quite as rapid as the decline prior to that month. All segments of the industry were confronted with the problem of constantly increasing production costs in 1958, and there are no indications that this problem will ease in 1959.

In addition to the five per cent increase in replacement passenger car tire shipments over 1957, two other categories showed increases. Shipments of replacement truck-bus tires exceeded 8.50 million units in 1958, up three per cent from the preceding year, and shipments of 3.575 million farm tires showed an impressive gain of more than 14 per cent. Snow tire shipments also reached a new high in 1958. It is significant to note that more than 27 million of these special purpose, high traction tires are now in use in the U. S.

Free World rubber producing capacity was increased by more than 350,000 long tons in 1958 alone. Further planned expansions should increase the world's total new rubber producing capacity to more than 4.36 million long tons by 1962. Most of the new capacity will be in the form of synthetic rubber. After 1962, consumers will begin to feel the effects of forward-looking programs initiated in some producing areas in the replanting of high yielding natural rubber stocks.

H. C. Bugbee, president of the Natural Rubber Bureau, estimates that world-wide consumption of natural rubber amounted to some 1.95 million tons in 1958, as opposed to production of 1.92 million tons. It is expected that in 1959 world consumption will again exceed production by about 30,000 tons. Anticipated usage is 1.97 million tons against an output of only 1.94 million tons.

Natural rubber's share of total U. S. consumption in 1958 was about 480,000 tons. This figure is expected to rise to some 520,000 tons in 1959 and continue to go up in the ensuing years. Due to such factors as steadily increasing replacement and heavy-duty tire production, there is every reason to believe that all the natural rubber that can be produced will be readily absorbed.

Intensified research added many new items to the list of more than 40,000 rubber products produced by the non-tire segments of the



2300 Eau Claire St., Schofield, Wis. • Detroit Office: 1302 Cadillac Tower, Detroit, Mich.

rubber manufacturing industry. Sales of these non-tire products accounted for more than half of the industry's total dollar volume in 1958. Notable among new and improved products were such items as hose, belting and packing, and seals especially designed to meet the Space Age requirements of both industry and the military establishments for superior performance under extreme ranges in temperature.

PETROLEUM DOMESTIC demand for petroleum products reached another all-time peak in 1958, according to Frank M. Porter, president of the American Petroleum Institute. The rise of about 1½ per cent over 1957—from 3.218 billion barrels to 3.266 billion barrels—represented the 16th consecutive year that domestic demand has topped the previous 12 months.



2300 Eau Claire St., Schofield, Wis. • Detroit Office: 1302 Cadillac Tower, Detroit, Mich.

Total demand, however, which includes exports, is a more accurate barometer of oil's overall operations. It was down about 1⅔ per cent over 1957—3.368 billion barrels against 3.425 billion barrels—for the first time since 1946.

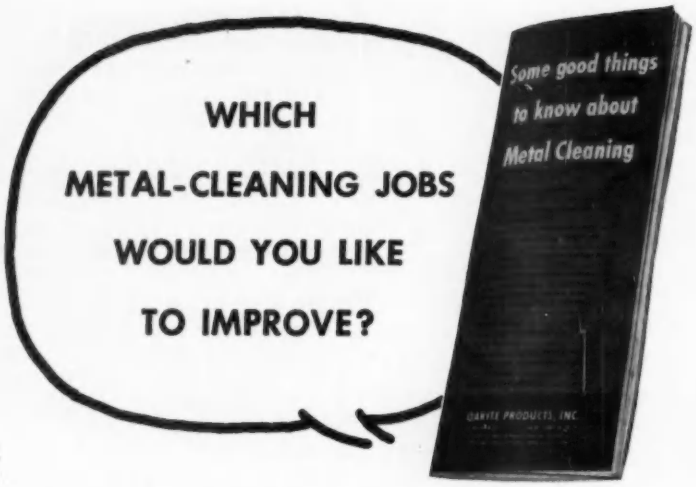
The decline in total demand was due, at least in part, to the fact that European demands upon U. S. petroleum supplies, imposed by the Suez crisis, caused the American industry's 1957 foreign shipments to show higher-than-normal totals. Exports for 1958, therefore, showed an expected large decline and affected total demand adversely.

In spite of an increase in domestic demand and a general improvement in inventories, the year as a whole was not a particularly good one, Mr. Porter continued. Widespread disagreements over imports of foreign oil added to the difficulties of the domestic picture in 1958. After months of debate, the issue of voluntary vs. mandatory controls still was unresolved, as of mid-December.

Surpluses of oil that harassed the industry during the first five months of the year were, for the most part, eliminated. By December, crude stocks actually were down from the 1958 peak. Refined products went up somewhat, but total stocks reflected the decrease in crude oil.

This was not done without cost, however. Production of domestic crude sagged for the second straight year. Refinery runs were trimmed materially, even though operable capacity climbed to an all-time high. Drilling operations were curtailed, and many rigs were stacked over a large part of the year. Well completions were off sharply for the second year in a row. Footage drilled plummeted to a five-year low. Exploratory drilling, so vital to future supplies of oil, also declined.

Motor fuel supply and demand were about evenly matched at the end of 1958, although consumption was up about 1½ per cent over 1957's record level. Production of motor fuel hit 1.418 billion barrels, while demand rose to 1.413 billion barrels from 1.388 billion barrels in 1957. Octane levels for both regular and premium gaso-



¶ Are you cleaning metal in the most economical way? *See page 9 of Oakite's FREE booklet on Metal Cleaning.*

¶ Are you cleaning metal the fastest way? *See page 12.*

¶ Do you need room-temperature cleaning combined in one operation with temporary rustproofing? *See pages 12 and 14.*

¶ Do you know the advantages of alkaline pickling? *See page 21.*

¶ Have you compared the values of iron phosphate coating and zinc phosphate coating in preparation for painting? *See pages 22 and 25.*

¶ Can you use a cleaner that removes rust and oil at the same time; often eliminating all need for pickling? *See page 30.*

¶ Do you have trouble stripping epoxy resins, pigment residues, phosphate coatings and under-paint rust? *See page 31.*

¶ How do you clean parts that are too large to be soaked in tanks or sprayed in machines? *See page 31.*

¶ Are you getting full profit out of your finishing barrels? *See page 32.*

¶ What do you do when oversprayed paint neither floats nor sinks in your paint spray booth wash water? *See page 35.*

¶ Do you need better protection against rusting in process or in storage? *See page 37.*

FREE For your copy of *"Some good things to know about Metal Cleaning"* write to Oakite Products, Inc., 28A Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE
SCIENCE

Technical Service Representatives in Principal Cities of U. S. and Canada
Export Division Cable Address: Oakite

lines showed continued improvement. Since 1941, the octane level of regular gasoline has climbed from 80.1 to 89.8, while premium rose from 86.8 to 97.6. Super fuels on the market boast octane ratings of 100 plus.

Output of natural gas liquids declined to 289 million barrels in 1958, the first reversal this group has experienced since 1933. Crude production in the U. S. showed a decline to 2.461 billion barrels from 2.617 billion barrels in 1957. Total output of liquid petroleum in 1958 amounted to 2.750 billion barrels, compared with 1957's record high of 2.912 billion barrels.

Operable refining capacity increased to 9.743 million barrels daily, but "through-put" declined to an average of 7.594 million barrels daily. This was 325,000 barrels daily under 1957, and was a good indication of the reduced rate of industry activity.

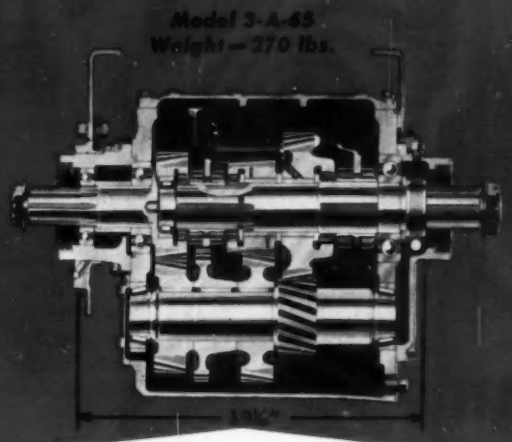
Despite the hefty cutbacks in 1958, oil companies continued to invest heavily in the future. Preliminary reports from Chase-Manhattan Bank indicated capital expenditures in 1958 were only slightly under the 1957 peak of $6.4 billion. Since the end of WW II, oil companies and oil men have poured more than $56.850 billion into capital expansion and development. The industry will celebrate its first centennial during 1959.

PLASTICS

ANOTHER record was chalked up by the plastics industry in 1958 as the production of plastics and resins materials increased five per cent to a new all-time high of about 4.544 billion lb. This estimate, announced by The Society of the Plastics Industry, Inc., compares with actual production in 1957 of 4,328,115,000 lb.

Dollar value of the 1958 production of plastics products was approximately $2.272 billion. This compares with $2.164 billion in 1957.

Since the 91-year-old plastics industry started compiling raw material production figures in 1922, it has established a new production record in 31 of these 36 years, including the last six. SPI estimates

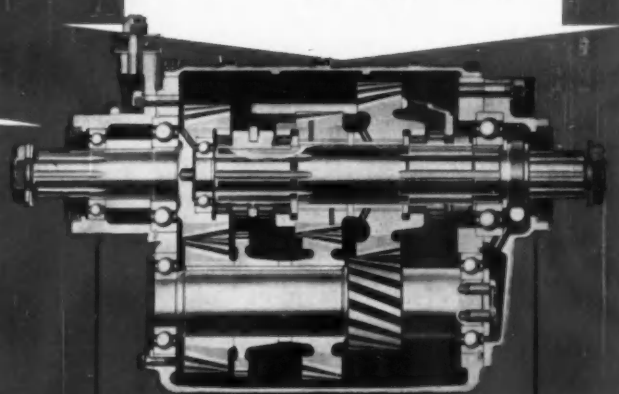


92 Series (Heavy-Duty)

MODEL	RATIOS		
	High	*Medium*	*Low*
3-A-92	.75	1.00	2.09
3-B-92	.84	1.00	1.24
3-C-92	.75	1.00	2.64
3-D-92	.75	1.00	1.24
3-E-92	.84	1.00	2.09
3-F-92	.84	1.00	2.64
3-G-92	1.00	1.327	2.09
3-H-92	1.00	1.327	2.64

65 Series (Medium-Heavy-Duty)

MODEL	RATIOS		
	High	*Medium*	*Low*
3-A-65	.754	1.00	2.221
3-B-65	.804	1.00	1.239
3-C-65	.754	1.00	1.239
3-D-65	.804	1.00	2.221
3-E-65	.804	1.00	1.74
3-F-65	.754	1.00	1.74
3-G-65	1.00	1.32	2.221
3-H-65	1.00	1.32	1.74





Now ...the most complete line of 3-speed AUXILIARY Transmissions

The Fuller Manufacturing Company now offers the most complete line of three-speed auxiliary transmissions . . . for transport, logging, construction, mining and crane carrier services . . . at lower prices than competitive units in a comparative capacity range.

The extremely rugged heavy-duty 92 Series has been completed by the addition of 5 new sets of gear ratios, Models 3-D-92 through 3-H-92. Four new sets of gear ratios, Models 3-E-65 through 3-H-65 have been added to the medium heavy-duty 65 Series.

Split Gears and GO

The expanded line of three-speed auxiliary units includes splitting ratios, both underdrive and overdrive. With these splitting ratios, the engine can operate at maximum horsepower through a full range of vehicle speeds. Ideal for over-highway operation, the extra gears allow faster schedules, greater profits.

Deep Reductions

Deep reductions, in combination with splitting ratios, offer maximum flexibility both on and off-highway where the deep reduction is required for extreme grades and soft footing, and where splitting efficiency is required for traffic conditions.

Longer Equipment Life

With engines working in the most efficient torque and horse-power range, there is less lugging . . . less wear . . . and greater fuel economy. Result: lower maintenance costs, less downtime, longer engine and transmission life.

FULLER

Fuller

TRANSMISSIONS

FULLER MANUFACTURING CO. Transmission Division • Kalamazoo, Mich.
Subsidiary, Eaton Manufacturing Company

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.

that another new production record of five billion lb will be established in 1959.

Even though a number of the basic plastics raw materials did not reach 1957's rate of production, the others increased and at a rate which carried the total production for the industry with them. Estimated 1958 production for some of the basic plastics raw materials, compared with actual 1957 figures, is shown in the accompanying table.

Materials	1958 Estimated Pounds	1957 Actual Pounds	Per cent Change
Cellulosics	139,000,000	146,112,000	— 6%
Phenolics	510,000,000	532,306,000	— 5%
Polyesters	115,000,000	96,232,000	+20%
Polyethylene	920,000,000	707,500,000	+30%
Polystyrene	710,000,000	673,226,000	+ 5%
Urea and Melamine	332,000,000	349,077,000	— 5%
Vinyls	904,000,000	886,506,000	+ 2%

As a result of a survey conducted by SPI among 892 company members in the U. S. (365, or 41 per cent replied), it is evident that last year wound up as a fairly satisfactory one in the plastics industry as a whole. It is also apparent that 1959 gives every indication of continuing the improvement of the last five months of 1958.

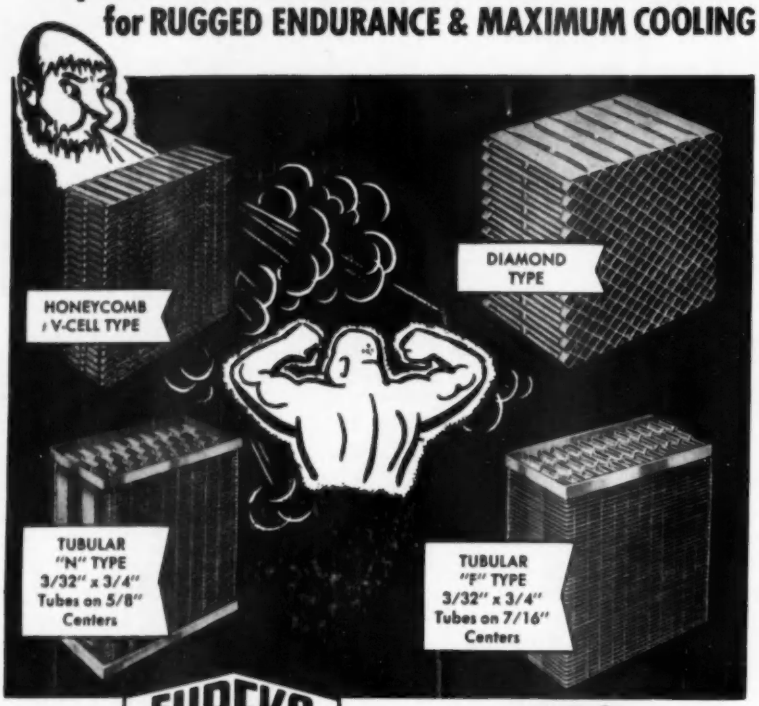
The plastics industry believes that sales volume is going up in 1959. A period of relative price stability is anticipated and material costs and wage rates are not expected to change substantially. Profits will be higher, and more companies plan to expand this year than last.

High-density polyethylene continued its expansion into many new applications in 1958. Polypropylene, another member of the olefin family, attracted increased attention after being commercially introduced only a year ago. Since new markets are constantly being developed, other raw materials, such as ABS plastics, allylics, epoxys and urethanes, experienced a widening of their applications.

ROAD BUILDING FINAL tabulations are expected to show that all units of Government — Federal, state and local—invested $6.2 billion in highway capital expenditures in 1958. This would represent an increase, according to the American Road Builders Association, of 9.6 per cent over the 1957 total. ARBA predicts a 13.7 per cent increase for 1959 with subsequent gains pushing the total program up past the $8 billion-a-year level by 1962.

About $1.97 billion, or nearly 32 per cent of the total outlay in 1958, represents Federal participation. Next year, as the accelerated Federal-aid program gets into high gear, Federal funds will account for about 42 per cent of the

Depend on EUREKA RADIATORS
for RUGGED ENDURANCE & MAXIMUM COOLING



EUREKA

OVER 30 YEARS OF SPECIALIZATION

For over 30 years, EUREKA Cores and Radiators have served the automotive industry with utmost dependability. Our facilities, equipment, and personnel are available for your needs. We welcome the opportunity of integrating our specialized skills with your needs to help you achieve a well-planned production schedule.

What are your requirements? We can build Radiators to your order in any type, to any size or shape. Send us your blueprints for prompt quotations!



EUREKA RADIATORS AND CORES
for CARS, TRUCKS, TRACTORS and SPECIAL APPLICATIONS.

AUTO RADIATOR Manufacturing Co.
Guaranteed Radiator Cores Since 1915
2901-17 INDIANA AVE. • CHICAGO 16, ILLINOIS

WHY ROCHESTER-GM CARBURETORS ARE

AMERICA'S NUMBER ONE ORIGINAL EQUIPMENT CARBURETOR



THE HEART OF THIS CARBURETOR GETS A CLEAN BILL OF HEALTH

Rochester-GM Carburetors provide a long and happy life for performance and economy. One reason is the 100% testing of all venturi clusters, the heart of every carburetor. This air testing assures accurate calibration in production so that these clusters never need adjustment in the field. This is just part of the extra care . . . the extra quality you get in a Rochester-GM Carburetor. And it's another big reason why Rochester-GM Carburetors are America's number one original equipment carburetor. *Rochester Products Division of General Motors, Rochester, New York.*

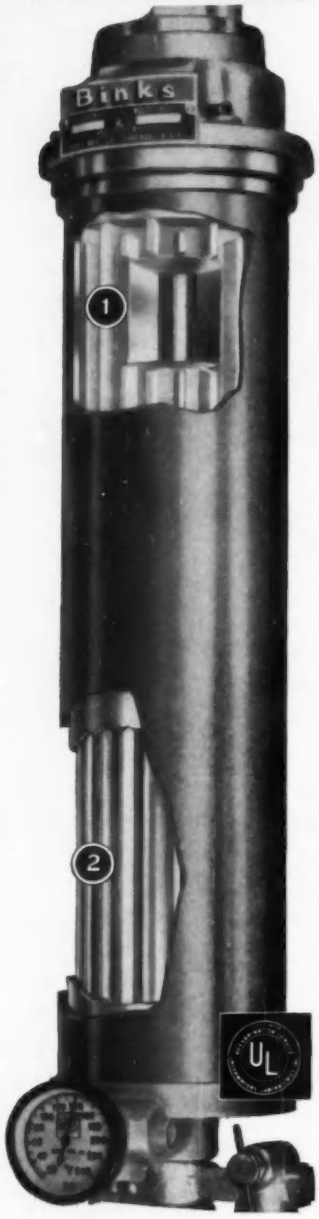
GM
GENERAL MOTORS

America's number one original equipment carburetors

ROCHESTER CARBURETORS

Circle 155 on Inquiry Card for more data

Today all other PAINT HEATERS became obsolete



1 ALL NEW CENTER HEAT

— Saves you 50% to 75% on operating cost. A 1500 watt element in the new Binks paint heater does the work of 3000 and 6000 watt units found in other heaters. There are two reasons why. First, the heat is in the center. It has to heat paint. Second, the new paint tract has an enormous heat contact area. Low heat does the work of high heat . . . actually eliminates a primary cause of bake-out.

2 ALL NEW 27 FOOT LONG PAINT TRACT

— Multi-finned tract design packs over 3½ sq ft of uniformly heated surface into a 15" height and 3½" diameter. You attain highest viscosity control at delivery rates up to 30 oz per minute. Temperature is thermostatically controlled at 150°F. The entire paint tract removes for easy maintenance.

4 MODELS U/L APPROVED

Available for 115v or 220v operation, with or without paint circulating pumps.

SEND FOR FREE BULLETIN

Describes the exclusive technical features of this all-new Binks paint heater. Available from your nearest Binks industrial distributor or write direct to the address below.

Ask about our spray painting school
Open to all—NO TUITION—covers all phases

Binks
EVERYTHING FOR SPRAY PAINTING


SPRAY GUNS


SPRAY BOOTHS


NATIONWIDE SERVICE

Binks Manufacturing Company
3120-30 Carroll Avenue West, Chicago 12, Illinois

9038

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

total outlay by all units of Government.

This cheery picture is not a complete one, however, states Maj. Gen. (Ret.) L. W. Prentiss, executive vice-president of the Association. The projected increases in activity will result almost wholly from the acceleration of the Federal-aid programs, particularly the Interstate System.

While it appears that the program is on a sound footing for 1959, basic legislative adjustments must be made in two areas. First, future Interstate authorizations must be adjusted, if the program is to continue as originally planned. Second, changes must be made in the financing of the Federal-aid programs to prevent a complete collapse of the Interstate construction program due to lack of funds for the fiscal year beginning July 1, 1960.

Recovery from such a disastrous disruption in the overall construction program would be slow and painful. Legislative leaders in highway matters in both houses of Congress are fully aware of this situation and have expressed a determination to initiate essential remedial legislation.

Construction Component

Excluding payments for preliminary engineering and right-of-way acquisition—in other words, considering only the construction component—this is the picture:

Year	Expenditures (billions)	Per Cent Increase
1957	$4.870	12.1
1958	5.138	5.6
1959	5.715	11.3

During 1958, the non-Federal-aid highway programs showed a net incline in expenditures. Small increases in the amounts spent on projects financed wholly by State and local governments and on Federal roads built on Federal lands were offset by the sharp decrease in the construction of toll facilities.

The total amount spent on all non-Federal-aid highway construction is expected to decline again in 1959. By 1960, projects financed wholly by State and local

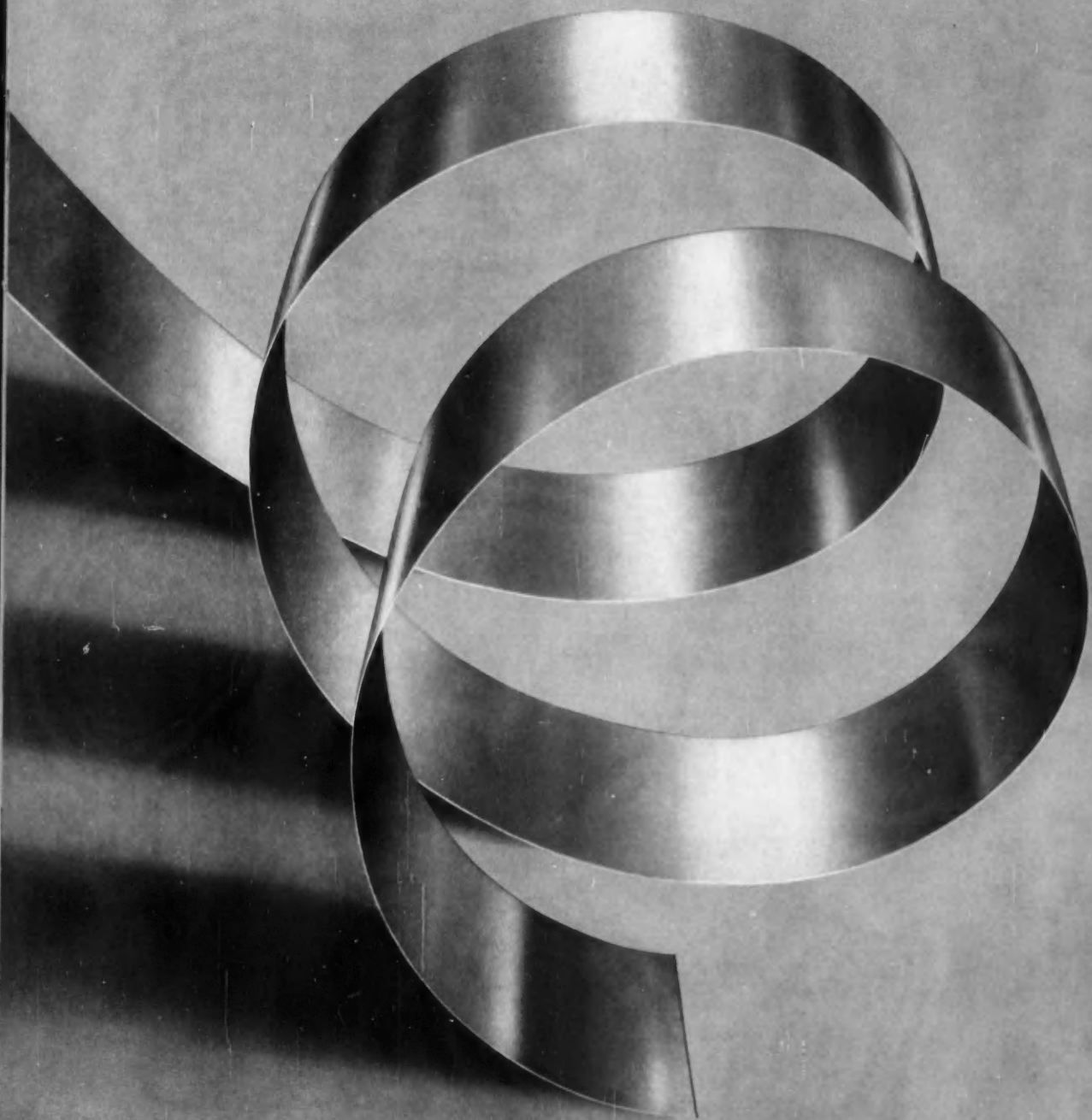
(*Turn to page* 105, *please*)

Circle 156 on Inquiry Card for more data

Circle 157 on Inquiry Card for more data ⟶

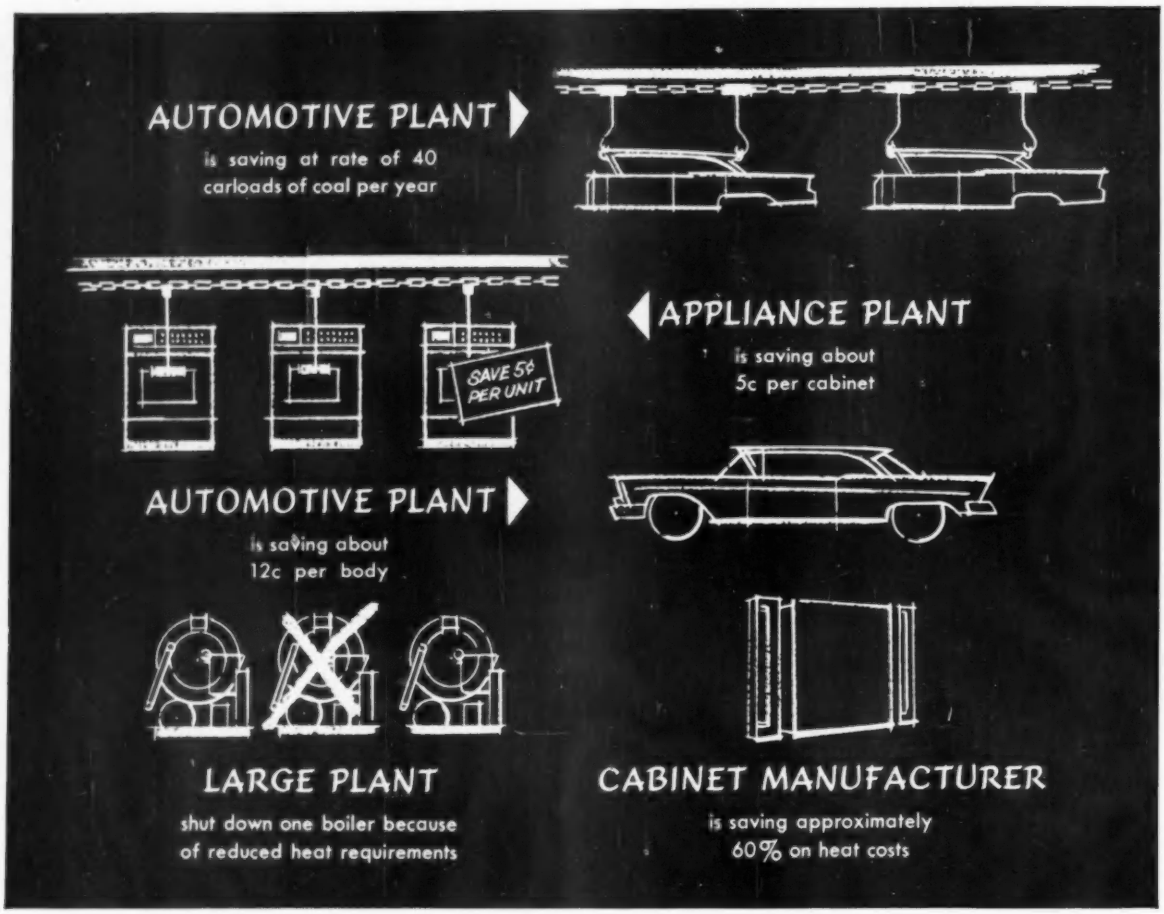
stainless strip — to your specifications

If stainless strip is part of your product, consider using Crucible stainless. Crucible precision-rolls it to your exact specifications — produces finishes that are surpassingly lustrous. And Crucible's painstaking methods ensure uniform metallurgical quality as well as gauge uniformity in coil after coil. Why not obtain these combined qualities next time you need stainless? Crucible stainless is available in all gauges down to .010" and in all widths. Write to *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*



CRUCIBLE STEEL COMPANY OF AMERICA

Canadian Distributor — Railway & Power Engineering Corp., Ltd.



high quality coatings... spectacular savings, too! New COLD BONDERITE SYSTEM

These are not isolated cases. Everyone saves when they change from conventional hot phosphating to the new Cold Bonderite System!

The difference is in heat required. Cleaner, rinse and Bonderite operate 40° to 75° cooler than in conventional installations.

Results produced by the Cold Bonderite System equal the highest Bonderite quality standards. Chemical costs are comparable to hot systems.

Many plants, from the largest on down, have changed to the Cold Bonderite System in their finishing lines. They've cut costs drastically. You can, too. Write or call today!

PARKER RUST PROOF COMPANY
2178 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE	TROPICAL
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces	heavy duty maintenance paints since 1883

Since 1914— leader in the field

*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

(*Continued from page* 102)

governments will be on the increase. The rise will be sufficient to offset the continued decline in the construction of toll facilities.

Looking ahead to 1962, and again considering the construction component alone, total Federal expenditures should rise 102.9 per cent above the 1958 level. During this same four-year period, a 21.5 per cent increase in State matching funds (mainly due to the expansion of activity on the 90-10 Interstate program) is expected. A 17.6 per cent increase in State expenditures on non-Federal-aid projects and a 19.3 per cent rise in construction expenditures on projects financed wholly by local governments are also expected.

Dangers Lie Ahead

While 1959 shapes up as a bright year for highway construction, the situation is an extremely dangerous one in view of these unvarnished facts:

(a) The Interstate System will cost about $41 billion, instead of the original estimate of $27 billion.

(b) Even the $41 billion does not cover the cost of 6000 miles of the authorized 41,000-mile system. These 6000 miles, already part of the Interstate System, represent about 2000 miles of bond-financed toll roads and the equivalent of 4000 miles of freeways built by the States without Federal 90-10 money. Any scheme of reimbursing the States for these roads will necessarily increase the present $41 billion estimate.

(c) The 1956 and 1958 Federal-aid Highway Acts authorize the apportionment of the $20.325 billion of Federal funds for the Interstate System for the years 1960-69. Actually, $31.4 billion, or about $1.1 billion more a year, is needed.

(d) The "pay-as-you-go" Byrd Amendment was suspended only for 1959 and 1960. Unless action is taken, the program goes back

FOR LOWER
TON-MILE COSTS



Replace
with *DEPENDABLE*
CONTINENTAL RED SEAL POWER

In highway hauling, as elsewhere, profit margins continue to shrink, and wise choice of rolling stock becomes more essential than ever. That is why more and more truckers are replacing original equipment engines with rugged Continentals, engineered expressly for the job. Choose from the models listed below. See your distributor today.

RED SEAL TRANSPORTATION ENGINES

GASOLINE

Model	Cyl.	Displ.	Bare Engine H.P.
N4062	4	62	26.3 @ 3500 RPM
Y4069	4	69	28.0 @ 3400 RPM
Y4091	4	91	36.0 @ 3400 RPM
F4124	4	124	47.0 @ 3200 RPM
F4140	4	140	52.0 @ 3200 RPM
F4162	4	162	58.0 @ 3200 RPM
F6186	6	186	77.0 @ 3500 RPM
F6209	6	209	90.0 @ 3500 RPM
F6226	6	226	98.8 @ 3500 RPM
F6244	6	244	103.3 @ 3500 RPM
M6271	6	271	96.5 @ 3000 RPM
M6290	6	290	108.0 @ 3000 RPM
M6330	6	330	125.0 @ 3000 RPM
M6363	6	363	146.0 @ 3000 RPM
B6371	6	371	123.5 @ 3000 RPM
B6427	6	427	142.0 @ 3000 RPM
FO6226	6	226	126.2 @ 3400 RPM
K6271	6	271	114.5 @ 3200 RPM
K6290	6	290	123.0 @ 3200 RPM
K6330	6	330	147.0 @ 3200 RPM
K6363	6	363	162.0 @ 3200 RPM
T6371	6	371	143.8 @ 3000 RPM
T6427	6	427	170.0 @ 3000 RPM
U6501	6	501	186.0 @ 2600 RPM
R6513	6	513	192.2 @ 2800 RPM
R6572	6	572	220.0 @ 2800 RPM
R6602	6	602	232.0 @ 2800 RPM
S6749	6	749	250.0 @ 2800 RPM
S6820	6	820	300.0 @ 2800 RPM
V8603	8	603	260.0 @ 3200 RPM

CUSHIONED POWER DIESEL

Model	Cyl.	Displ.	Bare Engine H.P.
TD6427	6	427	146.5 @ 2600 RPM
RD6572	6	572	172.0 @ 2400 RPM
VD8603	8	603	200.0 @ 2800 RPM
SD6802	6	802	225.0 @ 2200 RPM

PARTS AND SERVICE EVERYWHERE

CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD ®

Continental Motors Corporation
MUSKEGON • MICHIGAN

6 EAST 45TH ST., NEW YORK 17, NEW YORK • 3817 S. SANTA FE AVE., LOS ANGELES 58, CALIF.
6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 1252 OAKLEIGH DR., EAST POINT (ATLANTA) GA.

Circle 159 on Inquiry Card for more data

on a cash basis in 1961.

(e) Based upon the Treasury forecast of the status of the Highway Trust Fund released last January, and the subsequent increase in authorizations for 1959 and 1960 contained in the 1958 Act, there will be no funds available in 1961, on a cash basis, for the Interstate Program. Furthermore, the authorized ABC funds would have to be cut by $100-$200 million.

In short, the highway program needs more authorizations and money. As long as this dark cloud remains on the horizon, the increased highway construction scheduled for 1959 will be undertaken in a mood of sober anxiety.

MATERIAL HANDLING

THE 1959 business outlook for manufacturers of industrial material handling equipment appears bright to members of the board of directors of the Material Handling Institute, Inc. They feel that 1959 sales will total 10 to 12.5 per cent above the 1958 business volume.

The group also expressed opinions on business expectations for both the first and the second halves of 1959. Some of the MHI directors look for the greatest increases during the first six months of 1959. However, the general consensus is that business improvements will peak during the last six months, so that industrial material handling equipment sales in the second half of 1959 will be 7.5 to 10 per cent over first half sales.

L. West Shea, managing director of MHI, indicated that the basis for anticipating increased business is due primarily to two factors. First, costs will continue to rise forcing industry to offset this as much as possible with greater productivity, thus increasing sales of material handling equipment.

Second, Mr. Shea continued, many companies are planning expenditures for plant expansion, and modernization of existing facilities and equipment. Companies in all industries are becoming aware that a constant re-evaluation of their material handling facilities must be performed.

CONSTRUCTION

TOTAL construction performed in the U. S. broke dollar volume records in the face of a general business decline in 1958. It stands a good chance of reaching the $72 billion mark in 1959 with a six per cent advance, according to The Associated General Contractors of America.

The forecast for 1959 is divided into $52.2 billion in new construction and nearly $20 billion in maintenance and repair. Work put in place in 1958 is estimated at nearly $49 billion in new construction and $18.6 billion in maintenance and repair, for a total in excess of $67.5 billion.

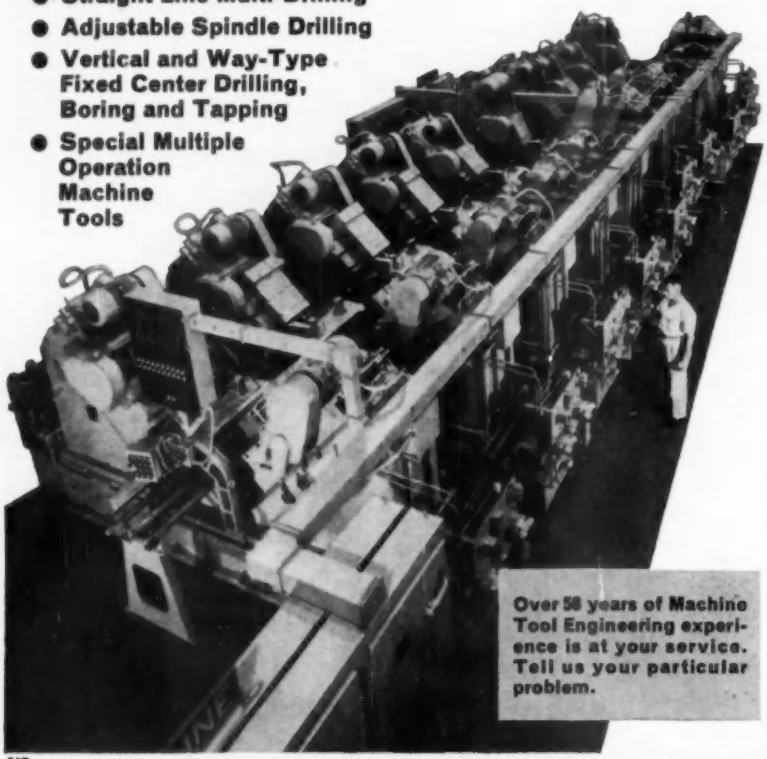
A 16 per cent rise in public construction, featuring increases in every category of state and local public works, with an accent on highways, will dominate the 1959

MOLINE

FOR GREATER | PRODUCTION • EFFICIENCY • SAVINGS

Use rugged, reliable "Hole Hog" machine tools for such jobs as:

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools



Over 58 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

112

Twenty-Station, Ten-Unit Transfer Machine for boring, counterboring, chamfering and valve clearance operations on V-8 automotive engine blocks. (Shown above)

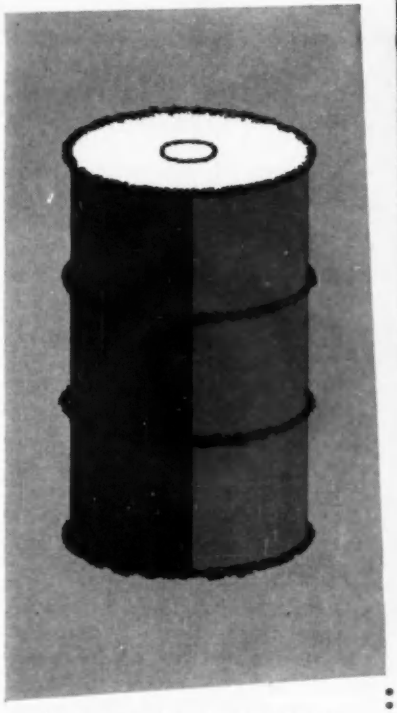
MOLINE TOOL CO. MOLINE, ILLINOIS

MOLINE TOOL COMPANY
100 20TH STREET • MOLINE, ILLINOIS

REPRESENTATIVES IN PRINCIPAL CITIES

for best finishes at lower cost... use Pennsalt's complete metal preparation service

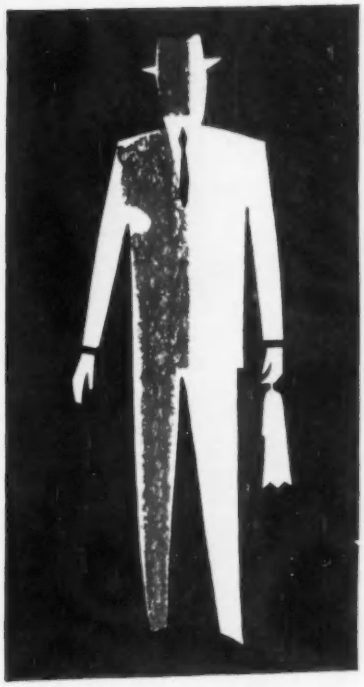
Let Pennsalt's "system approach" to metal preparation pay off for you. Pennsalt supplies the chemicals, the machinery and the engineering help to bring you best possible finishing results at considerable savings.



Materials: Pennsalt offers a complete line of metal processing chemicals—metal cleaners, etchants, brighteners, descaling and pickling compounds, phosphating agents, drawing lubricants, paint strippers, strippable vinyl coatings.



Machines: Pennsalt supplies automatic spray coaters, power spray washers, automatic pickling machines, phosphatizing machines, and complete finishing systems, built to your specifications.



Men: Pennsalt field men are specialists in metal preparation. They're well qualified to analyze your present or planned process, give you detailed recommendations, and set up a finishing line for you. They make regular service calls to keep your line running smoothly and profitably... and show you how to save chemical costs.



FOR THE AUTOMOTIVE INDUSTRY

Write for this new folder on Pennsalt metal processing chemicals for the automotive industry.

... a better start for your finish

Pennsalt Chemicals
ESTABLISHED 1850

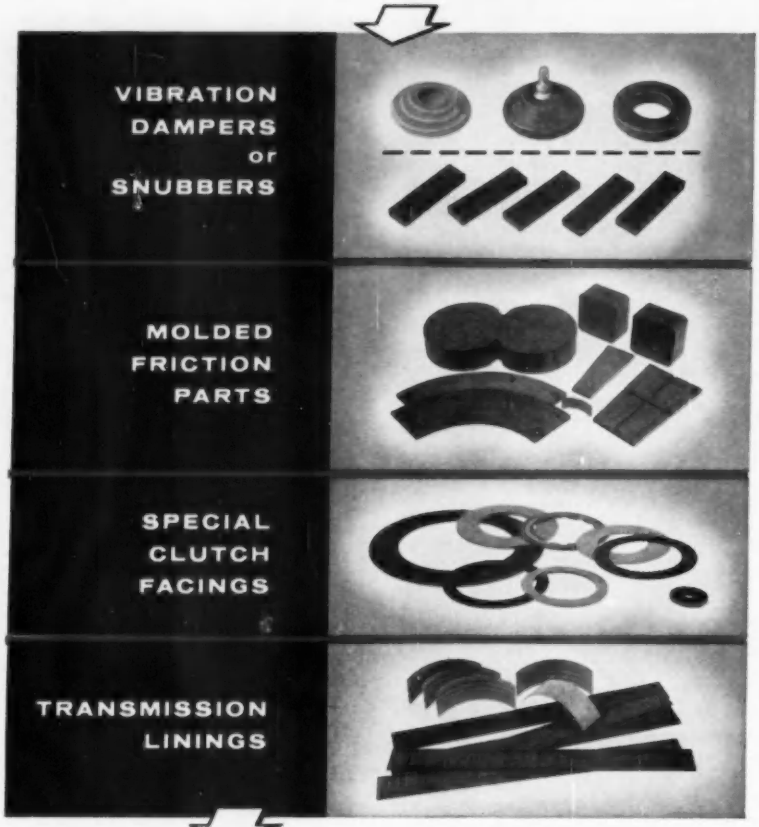
Call or write Pennsalt today for a consultation and quotation on your requirements.

Metal Processing Department 691
PENNSALT CHEMICALS CORPORATION
Three Penn Center, Philadelphia 2, Pa.

Circle 161 on Inquiry Card for more data

let WORLD BESTOS help you

in the design and production of



● World Bestos offers you more than 30 years' engineering and manufacturing experience in the producion of molded friction parts. Chances are our immense resources and facilities can supply you with molded parts and friction components—to meet your requirements—at a savings in both time and money.

● Send your blueprints (or samples) for prices and delivery information to WORLD BESTOS, Industrial Products Section, New Castle, Ind., Phone: 2360. Write for free illustrated folder.

WORLD BESTOS NEW CASTLE, INDIANA

DIVISION OF THE Firestone TIRE & RUBBER COMPANY

Industrial and Automotive Brake Blocks and Linings • Transmission Linings • Special Clutch Facings • Vibration Controls • Sheet Packing

construction scene. A moderate advance in residential activity and continued high levels of commercial and public utility construction should more than offset a further slide in industrial building and a slight drop in farm construction.

The annual AGC review and outlook statement estimated that construction of all types in 1958 increased three per cent over 1957. Increasing contract awards and improving economic conditions were seen as heralding the beginning of a new era of construction growth in 1959. Basic assumptions are: 1) construction costs will not rise inordinately; 2) materials will be plentiful; 3) no prolonged work stoppages will occur in basic industries; and 4) international complications will not seriously affect economic activity in the U. S.

Total volume in 1958 of nearly $68 billion accounted for a rise in construction's proportion of the gross national product from 15 to 15.5 per cent. This was the 13th consecutive annual increase in dollar volume of total construction activity, including both contract construction and force account operations.

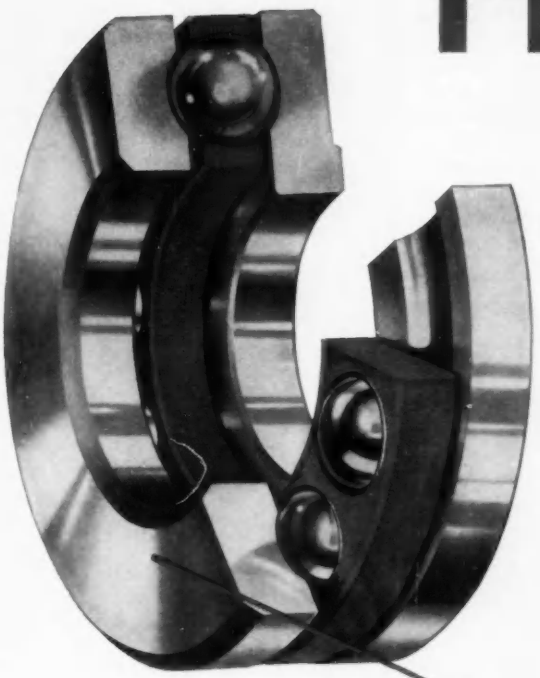
A high rate of public works and a surge in residential activity in the closing months of the year pushed new construction to nearly $49 billion, two per cent above the 1957 total. In terms of physical volume, however, this was offset by an increase in construction costs.

Construction costs, in the aggregate, rose 2.9 per cent during 1958. Wages paid by contractors increased by 5.6 per cent, and prices of basic construction materials were nearly stabilized. The Government's index of bid prices for Federal-aid highway construction declined three per cent during the first three quarters of 1958.

For the first time since 1949, private construction at about $33.9 billion failed to increase in 1958. This was due almost solely to the sharp decline in industrial building resulting from the slump in plant and equipment expendi-

Circle 162 on Inquiry Card for more data

PRECISION



in Aetna Bearings:

Flatness to .00003″

Finish to 5 micro inches

Bore and O.D. Tolerances to .0002″

Parallelism to .0001″

Concentricity to .0002″

Squareness to .0003″



Illustrated is the Optical Flat—only one of the many exceedingly precise instruments which insure the maintenance of these exacting precision standards.

Aetna Bearing Precision is as close to perfection as it is possible to achieve with advanced production methods, extremely accurate precision equipment, constant inspection-checking with special fine-measurement gages, and the integrity of a skilled, experienced personnel.

Each individual process in the entire production procedure is checked and inspected for exact conformity to absolute pre-determined specifications from the receipt of raw material through to completion and final assembly—then checked and inspected again as a completed unit for accuracy, smoothness and operating efficiency.

The result is longer service life—greater ease of installation—and continued, smooth-running anti-friction performance. *You have a better operating product when it is equipped with Aetna Bearings.*

PRECISION PARTS

held to the same exacting standards, produced in quantity at low cost to your exact specifications. Sizes up to 38″ O.D. Surface finishes, parallelism and structural characteristics as specified.

You are invited to submit blueprints, quantities and delivery requirements for quotation.

AETNA BALL AND ROLLER BEARING COMPANY

Aetna

DIVISION OF PARKERSBURG-AETNA CORPORATION • 4600 SCHUBERT AVE. • CHICAGO 39, ILL.
In Detroit: SAM T. KELLER, 1212 Fisher Bldg.

ANTI-FRICTION SUPPLIERS TO LEADING ORIGINAL EQUIPMENT MANUFACTURERS SINCE 1916

tures which marked the recession.

Private industrial building fell more than 30 per cent to about $2.4 billion. It was offset by a recovery in residential activity, while the other major business categories held near their 1957 levels. Commercial and public utility construction continued at their high levels of $3.6 billion and $5.6 billion, respectively.

Public construction rose six per cent to $15 billion, sparked by an eight per cent advance in highway construction. Major public categories were: highways, $5.4 billion; education, $2.9 billion; sewer and water systems, $1.4 billion; military construction, $1.2 billion; conservation and development, $1 billion; and public housing, $830. million.

The six per cent increase seen for 1959 will be the largest advance in four years. The extent to which dollar volume of new construction will exceed $52 billion will hinge much on the volatile residential market, which is heavily influenced by credit policies, and on the extent of recovery in the rate of capital expenditures by business.

The major part of the advance will take place in public construction, increasing 16 per cent to $17.4 billion, with a significant spurt in highways (about $6.2 billion). Private construction should increase three to four per cent to nearly $35 billion. Farm construction is expected to decline slightly to $1.5 billion, while industrial building should decrease at a reduced rate (about 10 per cent) to $2.2 billion, due to fewer projects planned in 1958. ■



"Tappets are our business"

JOHNSON JP PRODUCTS INC.

MUSKEGON, MICHIGAN

• • •

Trends in Construction Equipment

(*Continued from page* 69)

plate dry-type, with ceramic-button friction elements. It is manually operated, but has an air-assist Rotochamber connected to the linkage for ease of operation. The heavy-duty constant-mesh helical-gear transmission is fitted with an air-actuated inertia brake on the countershaft to facilitate shifting. A torque-proportioning differential, designed and built by A-C, automatically controls the delivery of torque to the drive wheels.

The bowl has a ⅝-in.-thick alloy steel plate bottom. Hydraulic lift jacks under the scraper main frame are positioned to give low speed, high-leverage action when the cutting edge is in dig position. This action changes to higher speed and lower leverage as the bowl approaches carrying position.

Large-capacity synchronized air brakes, footpedal controlled, operate tractor and scraper brakes simultaneously. Two-stage selective hydraulic steering locks tractor and scraper into one rigid unit when the steerer is in neutral position. The motor scraper can make a 180-deg turn in about 29 ft. ■

EXECUTIVES READ
AUTOMOTIVE INDUSTRIES



An announcement of interest to manufacturers of steel parts

Improvements in today's STRESSPROOF® STEEL BARS WITH COPPER

1 **100,000 PSI YIELD STRENGTH** in all sizes . . . without heat treating.

2 **IMPROVED PHYSICAL PROPERTIES...** better fatigue life wearability, and resistance to atmospheric corrosion. Over-all quality is improved.

3 **IMPROVED MACHINABILITY...** STRESSPROOF with copper now machines faster and better than ever. It gives longer tool life, better finish, and more production from a day's run, according to shop production records.

4 **CLOSER TOLERANCES...** Tolerances for rounds have been tightened to meet the need for more precise parts as follows:

¼" to 1½"	Over 1½" to 2½"	Over 2½" to 3⅜"
+.000 −.004	+.000 −.005	+.000 −.006

5 **COMPARED WITH OTHER STEELS, STRESSPROOF COSTS EVEN LESS TODAY...** Also saves machining and heat treat costs, and you get a better quality part. It will pay you to take another look at this improved material.

Your STEEL SERVICE CENTER stocks contain today's STRESSPROOF. It has been produced and shipped over a several months' period.

JUST PUBLISHED! Use this coupon to request your copy of new bulletin, "Improvements in Today's STRESSPROOF Steel Bars."



La Salle STEEL COMPANY

1438 150th Street, Hammond, Indiana

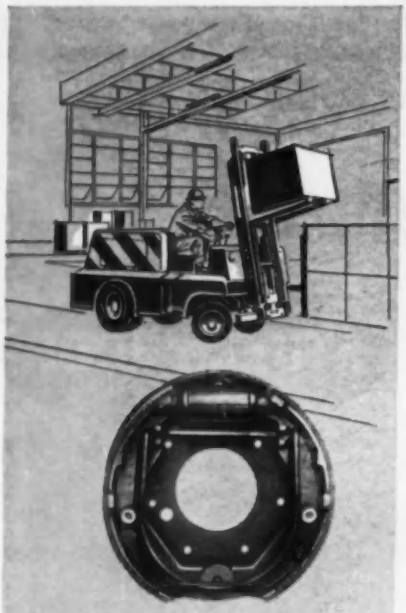
Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

Circle 165 on Inquiry Card for more data



FSH Series Hydraulic Brake . . . unequalled stopping power and control for every application where heavy-duty braking is required. Floating shoes give even lining load distribution and close control in either direction of travel. Wide range of sizes for industrial, material handling and construction applications.



"P" Series Power Air Brake . . . for heavy-duty automotive service. Unit mounted design offers compactness and simplifies installation. Open-type spider assures good internal ventilation and rapid cooling for longer lining life. Outstanding features for greater performance, lower maintenance.



"T" Series Air Brake . . . an economical brake designed for a variety of automotive applications. Precision-forged, one-piece cam shaft. Constant, equal rate of lift to both shoes. Fabricated steel brake shoes combine strength with lightness. Brake linings up to ½" thickness. Complete range of sizes.



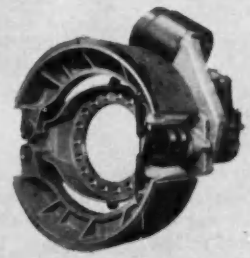
MORE THAN

coming soon . . . the New Stopmaster Brake . . .

for both highway and heavy-duty off-highway equipment!

It's the most advanced new brake design in 30 years—bringing you faster, surer stops . . . cooler operating temperatures . . . lower maintenance costs . . . lighter weight for greater payloads! This new air or hydraulic brake is designed to meet today's increased braking demands.



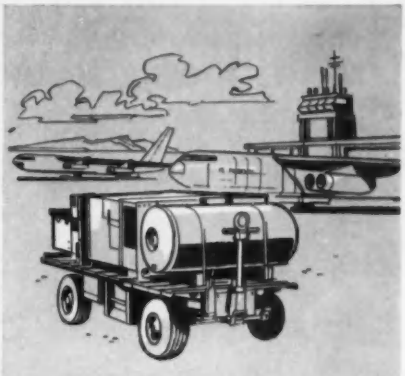


Heavy-Duty "P" Series Air Brake . . . offers better control, greater dependability, longer service for heavy-duty off-highway applications. Unit mounted design for compactness. Open-type spiders for lower operating temperatures and longer liner life. Wide range of capacities and sizes.





"DLM" Series Mechanical Brake . . . primarily a parking brake for trucks, buses, cranes and shovels, it also is ideal for use on farm equipment, hoists, lift trucks and other applications. Self-energizing two-shoe design. Only 8 parts with interchangeable shoes and springs. No lubrication required.





"DM" Duplex Mechanical Brake . . . for farm equipment, special-duty utility trailers, light-duty highway trailers and industrial machinery. Two identical shoes do an equal amount of work in either forward or reverse direction. Positive braking with immediate response. Simple design for low maintenance.

A MATCH FOR ANY MOVING POWER...

ROCKWELL-STANDARD BRAKES!

Whatever the size or type of brake you require . . . whether it's for an industrial, agricultural, construction, or automotive application . . . Rockwell-Standard's complete line offers a brake that is specifically designed for your purpose.

Products of over 40 years of leadership in brake design and manufacture, Rockwell-Standard Brakes assure the ultimate in safety, dependability, and trouble-free long life. Only Rockwell-Standard combines brake designing, engineering, testing and manufacturing in one integrated facility, to bring you the industry's most advanced brake products.

Every Rockwell-Standard brake design has been proven by rigid tests, both in the laboratory by trained technicians, and over thousands of miles of demanding road trials. It's just one more reason why you can be sure . . . your *best* brake is Rockwell-Standard!

© 1959, R-S Corporation

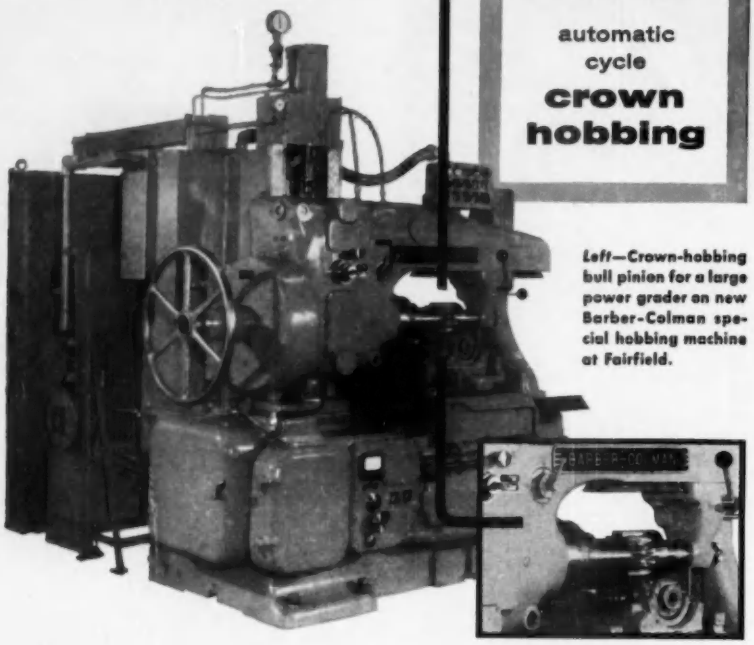
ROCKWELL R STANDARD

ROCKWELL-STANDARD CORPORATION

BRAKE DIVISION | Ashtabula, Ohio

another new, ultra-modern
FAIRFIELD GEAR MAKING
facility . . . .

automatic
cycle
crown hobbing



Left—Crown-hobbing bull pinion for a large power grader on new Barber-Colman special hobbing machine at Fairfield.

Saves Time! Cuts Costs!
Produces Better Gears *for you*

You get every benefit of latest cost-cutting methods and equipment when your gears are produced by Fairfield. "Automatic Cycle Crown Hobbing" is one interesting example of a new method for generating *accurately* crowned teeth on spur gears and pinions. In addition to significant time savings produced by a remarkably versatile machine, subsequent finishing costs can be reduced, or may be completely eliminated. Special tooth strength characteristics may also be obtained economically.

Check with Fairfield on all of your gear requirements. You get the advantage of high production rates and big volume output in an ultra-modern plant designed exclusively for producing fine gears EFFICIENTLY, ECONOMICALLY. *Call or write.*

FAIRFIELD
MANUFACTURING CO.
2303 S. Concord Road Lafayette, Indiana
TELEPHONE: 2-7353

Ask for interesting, illustrated bulletin.





Gears and Differentials for FINE GEARS *Made to Order for:*

TRACTORS • HEAVY DUTY TRUCKS • AGRICULTURAL MACHINERY • POWER SHOVELS AND CRANES
MINING MACHINES • ROAD GRADERS • BUSES • STREET SWEEPERS • INDUSTRIAL LIFT TRUCKS

SHORTIES

The death rate per 100 million vehicle miles dropped from 14.7 in 1937 to 6.4 in 1956.

•

The number of automobiles in use has more than tripled since 1941 in two states and more than doubled in 19 states.

•

Over 79 million licensed drivers drive an average of 8070 miles annually for a total of 643 billion miles.

•

Special taxes on highway uses hit a new high of $8.8 billion.

•

Of each new car dollar, 24 cents goes to taxes.

•

Repayments on automobile installment loans exceeded new credit extensions in 1958 for the first time in more than three years.

•

The wind tunnel test model of a new jet transport built to 1/20th scale required nearly nine months of work and 2000 parts.

•

A major aircraft component manufacturer has come up with an electronic device that can check from 200 to 1600 complicated circuits in aircraft and missiles.

•

The military services during 1959 will operate seven aircraft models capable of speeds in the Mach 2 range.

•

Transport experts predict that the nation's airlines will carry 118 million passengers by 1970, 170 per cent more than the 44 million carried last year.

•

Airport control towers in the U. S. handled about 25,262,000 takeoffs and landings in 1957—48 every minute of the day and night.



Americans in motion depend upon Holley

The startling advances in the last decade in pounds of thrust, in horsepower have exceeded nearly every other decade in America's engine development history. The challenge of contributing to this advance has fallen to Holley engineering teams with such varied problems as lighter weight, more compact fuel controls for jet engines, carburetors with more and more breathing capacity, ignition systems with more and more accuracy.

Holley's two teams of design and manufacturing engineers have developed products as unlike the carburetors of the past as jet engines to Stanley steamers.

Today, Americans stand on the threshold of a decade which will far outmode the power outputs of today. Holley engineers are currently working on control systems for power outputs relegated just yesterday to science fiction.

As in the last fifty years, Americans in motion will depend upon Holley products.

For more information about Holley products, automotive and aircraft, write to HOLLEY CARBURETOR CO., 11955 E. Nine Mile Road, Warren, Michigan.

I-28

LEADER IN THE DESIGN, DEVELOPMENT AND MANUFACTURE OF AUTOMOTIVE AND AVIATION FUEL METERING DEVICES

HOLLEY Carburetor Co.

Circle 168 on Inquiry Card for more data

More Government Contract Awards

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, plant equipment etc. This list is for the period December 1 to December 31, inclusive.

ARO EQUIPMENT CORP., Bryan, Ohio
Drill — Pneumatic portable—1250 ea—$39,688

AUTOMATIC TRANSPORTATION CO., DIV. OF YALE & TOWNE MFG. CO., Chicago, Ill.
Truck, forklift, gasoline—368 ea—$1,682,128

Barden Corp., Danbury, Conn.
Ball bearings, aircraft instruments—129,700 ea—$153,046

BARNES DRILL CO., Rockford, Ill.
Honing machine, horizontal—2 ea—$66,385

BEECH AIRCRAFT CORP., Wichita, Kans.
L-23D Army liaison airplanes—$3,031,960

BEECH AIRCRAFT CORP., Wichita, Kans.
Target aircraft, model KDB-1—$6,547,387

BENDIX AVIATION CORP., BENDIX PRODUCTS DIV., South Bend, Ind.
Spare parts, aircraft—$185,180

BEWLEY ENGINEERING CORP., Southport, Conn.
Spare parts, aircraft—$72,072

B. G. CORP., Ridgefield, N. J.
Spark plug, aircraft reciprocating—44,200 ea—$51,669

BOEING AIRPLANE CO., Wichita, Kans.
B-52 airplane, associated support items—$15,000,000

BOEING AIRPLANE CO., Wichita, Kans.
B-52 MTU—$385,000

CESSNA AIRCRAFT CO., Wichita, Kans.
T-37A aircraft—$12,345,000

CHAMPION SPARK PLUG CO., Toledo, Ohio
Spark plug, aircraft reciprocating—1,614,585 ea—$1,960,106

CHRYSLER MOTORS CORP., Detroit, Mich.
Truck—35 ea—$82,391

CHRYSLER MOTORS CORP., Washington, D. C.
Trucks—120 ea—$237,240

CLARK EQUIPMENT CO., Buchanan, Mich.
Truck, fork lift, gasoline driven—7 ea—$33,927

CLEVELAND PNEUMATIC TOOL CO., Cleveland, Ohio
Spare parts, aircraft—$100,809

CURTISS-WRIGHT CORP., PROPELLER DIV., Caldwell, N. J.
Propeller assys, components, parts, data, aircraft—$3,051,747

CURTISS-WRIGHT CORP., UTICA DIV., Utica, Mich.
Repair parts, Diesel engines, various—836 ea—$190,109

CUSHMAN MOTOR WORKS, Lincoln, Neb.
Motor Scooters—16 ea—$12,308

W. S. DARLEY & CO., Chicago, Ill.
Truck—1 ea—$10,765

EASTERN AIRCRAFT PRODUCTS CORP., Orange, N. J.
Spare parts, aircraft—$44,501

ELECTRIC AUTO-LITE CO., Toledo, Ohio
Battery, aircraft—43,289 ea—$779,288

FORD MOTOR CO., FORD DIV., Washington, D. C.
Trucks—265 ea—$554,502

GENERAL ELECTRIC CO., SMALL AIRCRAFT ENGINE DEPT., West Lynn, Mass.
Engines, aircraft—$1,250,000

GENERAL MOTORS CORP., AC SPARK PLUG DIV., Milwaukee, Wisc.
Spare parts, various aircraft—$93,745

GENERAL MOTORS CORP., ALLISON DIV., Indianapolis, Ind.
Turbo-prop engines, aircraft—$2,936,960

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.
Trucks—128 ea—$324,629

GENERAL MOTORS CORP., FOREIGN DISTRIBUTORS DIV., New York, N. Y.
Trucks—37 ea—$67,129

(*Turn to page* 118, *please*)

NEED HELP
In Cutting Holding Tool Costs?

SEIBERT SHUR-LOCK ADJUSTABLE ADAPTERS

● Better production machining methods at Seibert today make it possible to manufacture, in quantity, holding tools of improved quality without increased cost to you. The Seibert Shur-Lock adjustable adapter is one illustration. They are manufactured to precision tolerances from the highest quality hardened alloy steel, to give you the best in holding tools — certain to cut set-up time and give long service life. In addition, they are produced more efficiently than ever before which makes it possible to supply your needs promptly and at reasonable cost. Quality, Service and Price are the three reasons hundreds of users are today specifying Seibert tools. It will pay you to investigate the advantages of standardizing with Seibert.

WRITE TODAY FOR FREE ADAPTER BULLETIN AND LATEST PRICE LIST

Drop us a line today and ask for Folio 2-30 and a Price List — or, ask to have a Seibert representative call at your plant soon to check over your tooling problems. There's no obligation.

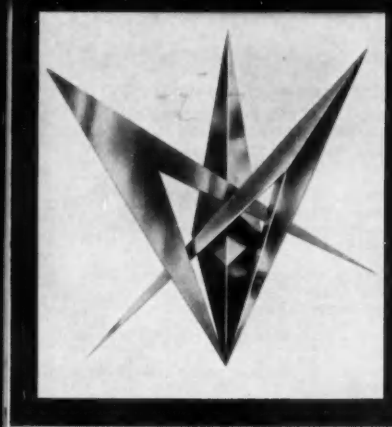




SEIBERT **SEIBERT & SONS, INC.** 1008 E. 24th STREET CHENOA, ILLINOIS

Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

Circle 169 on Inquiry Card for more data



This beautiful sculpture appropriately named "Flight of Progress" by Robert Edward Hamilton, stands in the lobby of the Detroit offices of the Stainless and Strip Division of Jones & Laughlin Steel Corporation.

Stainless by J&L . . . Decorative, Ductile and Durable



J & L STAINLESS STEEL . . . THE METAL OF TOMORROW THAT'S FUNCTIONAL TODAY!

In addition to adornment, Stainless Steel has qualities no other metal can offer. Its unusual ductility lends itself to severe shapes and designs. The unique quality of Stainless to blend itself perfectly with glass or painted areas further increases its desirability to the automotive manufacturer. The inherent cold working properties of Stainless actually make it stronger after fabrication and its functional beauty highlights the modern contours of today's automobiles. Its resistance to corrosion, pitting and peeling keeps brightwork looking bright for the life of the car.

The completely new facilities of Jones & Laughlin Stainless and Strip Division assure you of the highest quality Stainless and service starting with research and development through delivery and fabrication.

Improve your Products with . . .
JL STAINLESS STEEL
SHEET • STRIP • BAR • WIRE

Helpful data sheets and manuals are now available:

1. Laboratory Corrosion Data.
2. Data Sheets (please specify the grades in which you are interested).
3. Stainless Sheet and Strip Manual.

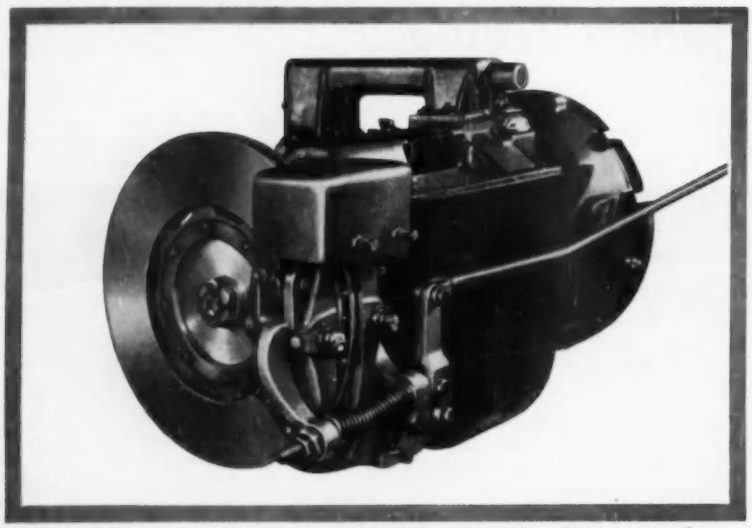
Write for your copy today.



Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34

Circle 170 on Inquiry Card for more data

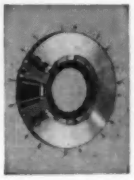
Automotive Equipment is Easier to Sell when equipped with TRU-STOP heavy-duty Brakes



Positive Protection Against Runaway or Parking Accidents

TRU-STOP brakes operate directly on the drive shaft. This means that they are not only excellent parking brakes, but dependable emergency service brakes as well. There's no dangerous self-energizing. TRU-STOP brakes have the surplus capacity for repeated use as an auxiliary to service brakes.

100% Ventilation Minimizes Fading



Brake efficiency depends on ability to dissipate heat rapidly and so prevent fading. TRU-STOP brakes are 100% ventilated. Discs are exposed to air even while braking. The TRU-STOP ventilation system circulates air *between* the disc plates.

Longer Life with Uniform Brake Pressure



The discs of TRU-STOP brakes are squeezed between the flat surfaces of the shoes. The brake lever operates both the front and rear lever arms simultaneously, and pressure is exerted on the center of each shoe. This puts the entire lining surface in contact, provides for even wear. TRU-STOP brake linings are *easy* to replace.

FOR POSITIVE PROTECTION...

Specify TRU-STOP BRAKES *on ANY Heavy-Duty Equipment that Requires Braking*



***WRITE* for Catalogs DH-33 and DH-530**

Automotive and Aircraft Division

AMERICAN CHAIN & CABLE

ACCO

TRADE MARK

601 Stephenson Bldg., Detroit 2

6800 East Acco Street, Los Angeles 22 • 929 Connecticut Ave., Bridgeport 2, Conn.

(*Continued from page* 116)

GENERAL MOTORS CORP., GMC TRUCK & COACH DIV., East Pontiac, Mich.
Trucks—2 ea—$19,571

GENERAL TIRE & RUBBER CO., Akron, Ohio
Wheel Assy, nose, spares, etc.—587 ea—$553,059

GLADDEN PRODUCTS CORP., Glendale, Calif.
Spare parts, aircraft—$83,349

GOODYEAR AIRCRAFT CORP., Akron, Ohio
Nose section, spares, data, missile—$1,700,000

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Wheels, brake assys, various aircraft—5401 ea—$2,775,852

GREEN BALL BEARING CO., Cleveland, Ohio
Ball bearing, annular misc. aircraft—36,000 ea—$50,400

INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks—43 ea—$172,264

MARLIN-ROCKWELL CORP., Jamestown, N. Y.
Roller bearing, cylindrical—$42,289

NORMA-HOFFMAN BEARINGS CORP., Stamford, Conn.
Roller bearing, cylindrical—2000 ea—$27,540

NORTH AMERICAN AVIATION, INC., Los Angeles, Calif.
Spare parts, F-86K aircraft—$150,374

NORTHROP AIRCRAFT, INC., Hawthorne, Calif.
T-36 airplanes, spare parts, ground support equipment—$16,926

PRATT & WHITNEY CO., INC., West Hartford, Conn.
Jigborer, vertical—$75,632

THE RAYMOND CORP., Washington, D. C.
Truck, lift, fork—7 ea—2 lots—$35,539

RETT PRODUCTS CO., Detroit, Mich.
Tank spare parts, replenishment—$65,044

SONOTONE CORP., Elmsford, N. Y.
Battery, aircraft—250 ea—$84,900

THE O. A. SUTTON CORP., Wichita, Kans.
Fuel tanks—$2,080,611

TIMPTE BROS., INC., Denver, Colo.
Semitrailer, lowbed—10 ea—$46,840

UNITED AIRCRAFT CORP., HAMILTON STANDARD DIV., Windsor Locks, Conn.
Starters, pneumatic, aircraft engine—$120,000

WESTERN ELECTRIC CO., INC., New York, N. Y.
NIKE spare parts & components—$217,271

WESTERN GEAR CORP., Lynwood, Calif.
Gear boxes, various aircraft—$105,335

WESTERN GEAR CORP., Lynwood, Calif.
Spare parts, aircraft—$75,437

WILLYS MOTORS, INC., Toledo, Ohio
Trucks—18 ea—$47,946

YALE & TOWNE MANUFACTURING CO., YALE MATERIALS HANDLING DIV., Philadelphia, Pa.
Truck, lift, fork—42 ea—$291,288



valve gear for any engine

Hydraulic and Mechanical Tappets (Barrel or Mushroom Type) of Alloy Steel, Hardened Alloy Cast Iron, Chilled Iron, or Alloy Chilled Iron • Push Rods • Adjusting Screws • Retainers

No matter what your valve gear requirements, it will pay you to check with Chicago's Tappet Division. For here you get the benefits of specialized techniques and facilities which, in 25 years of producing tappets and other valve gear, have established long records of trouble-free service . . . verified in over 25 million engines.

Chicago's special staff of tappet engineers can provide complete valve train designs for all types of engines . . . car, truck, tractor, diesel . . . aircraft, outboard, power mower, or industrial.

Their particular skill in development engineering will also prove a valuable addition to your own engineering staff. And the unique manufacturing and precision testing facilities especially developed by Chicago for valve train production provide you assurance of dependability and long life.

Whatever your valve gear problem, just call Chicago's tappet engineers today. You will find it advantageous to contact Chicago *while you are still in the preliminary design stages.*

THE CHICAGO SCREW COMPANY

ESTABLISHED 1872 • DIVISION OF STANDARD SCREW COMPANY

2701 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

Intercooling of Supercharged Engines

(*Continued from page* 64)

have been successfully turbocharged and intercooled with considerable increases in horsepower.

The successful application of air cooling has also been applied on engine installations of the two stroke type using positive displacement type blowers to furnish scavenging air. The cooling of scavenging air is of considerable importance on dual-fuel engines using natural gas as the fuel with pilot oil. The problem of maintaining high engine output becomes critical during summer time operation with high ambient temperatures. An air intercooler can successfully reduce the scavenging air temperature of 130 F off the blower to approximately 100 F. It will be noted that all of our dicussion thus far has mentioned air being cooled to 100 F. Air can be economically cooled to within 10 F of the cooling water temperature. We have considered cooling tower or evaporative cooler water at 90 F as being available for use in the intercooler. Of course, water temperatures lower than 90 F when used with an intercooler designed for water at 90 F will materially reduce the air temperature to the inlet manifold below 100 F. By the same token, water temperatures above 90 F will proportionately reduce the possible air temperature drop possible in the air intercooler.

Let us now consider some of the various problems encountered in the design of an intercooler. An intercooler is essentially a radiator having a heat transfer surface consisting of tubes and fins. The tube ends are rolled into a header plate to which is attached a water box or tank. Core sides, consisting of steel plates or castings, confine the air in its passage through the core and keep it from recirculating around the cooler.

Several types of cores have been successfully applied for use on intercoolers with the proper selection depending on the circumstances of water used, pressures contemplated for water and air, type of blower, etc. The most efficient core available, but one which can be used only with fresh water and only with centrifugal type low pressure turbochargers, is the flat tube type. First of all, water pressures should not exceed 50 psig. The air pressures over the core should not exceed 10 psig. Finally, brackish or sea water should not be used nor any fresh water containing large floating particles which might plug up the tubes.

Another highly efficient core consists of $\frac{3}{8}$ in. diameter tubes with plate type fins. This fin and tube arrangement permits the use of higher operating pressures and temperatures. This core can also be used for service with fresh water, brackish water, sea water or cooling tower water. Materials used, however, will vary depending on the type of water used as the cooling medium. For fresh water service, the tubes can be either copper or red brass and the fins can be aluminum or copper. The header and tank material in con-

ROCKFORD





MORLIFE® CLUTCHES

Insure SMOOTH Powerful Pick-Up in Heaviest Going

Compared to previous type clutch facings, Morlife® Clutch facings reduce foot pedal pressure up to 50%. They assure positive engagement—with power-holding grip. Provide a degree of heat resistance and dissipation never before available. They give several times the durability for prolonging clutch life and extend the time between pedal adjustments many times as long. Let ROCKFORD clutch engineers show you how these new advantages will improve the operating ease and prolong the on-the-job life of *your* product.

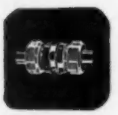
BW SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

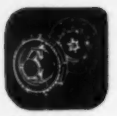


ROCKFORD Clutch Division BORG-WARNER
315 Catherine St., Rockford, Ill., U.S.A.
Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.


Small Spring Loaded


Heavy Duty Spring Loaded


Oil or Dry Multiple Disc


Heavy Duty Over Center


Power Take-Offs


Speed Reducers

CLUTCHES

A YALE PRODUCT FOR THE AUTOMOTIVE INDUSTRY

ONE YALE TRUCK DOES THREE JOBS ECONOMICALLY



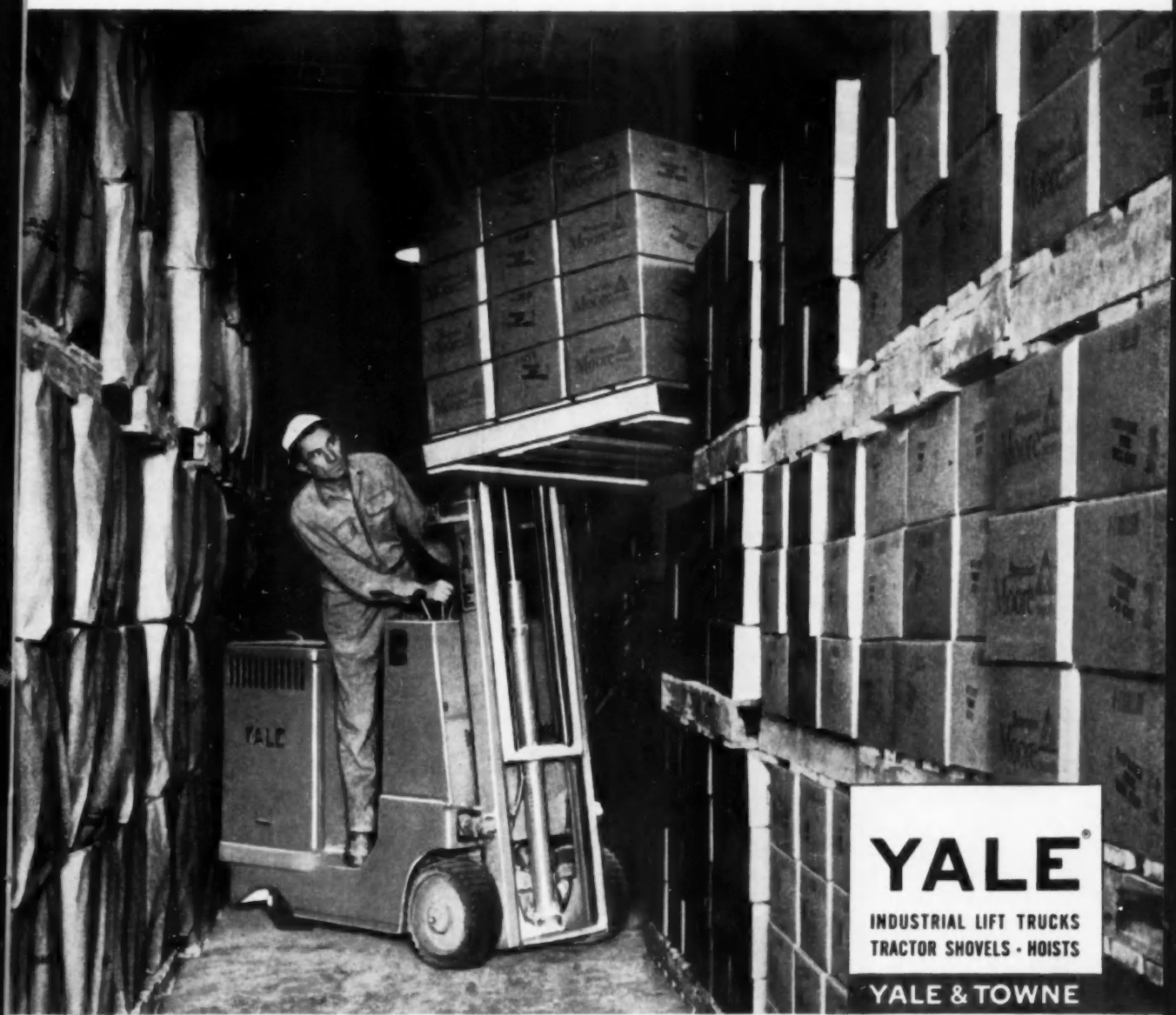
K-46 equally efficient in warehousing, on loading ramp, for mounting and dismounting operations

If your requirements call for a one-truck fleet, the versatile Yale K-46 is the truck for you!

Three features give this economical Yale truck an extraordinary degree of usefulness. *Compactness* makes it a good narrow-aisle truck. *Maneuverability* makes it the perfect truck for loading and unloading on the delivery ramp. *Standup cockpit* permits easy, fast mounting and dismounting... gives the driver a clearer view for loading operations and aisle movement.

The K-46 is the ideal truck for profitable short cycle operations. Compact as it is, this economical truck has *all* the features of the large Yale electric trucks. Exclusive Magnetic Cam-O-Tactor for controlled acceleration and smooth travel—rugged durability—low-cost operation—dead-man control and other safety features. Capacities, 2,000 and 3,000 lbs.

For information about this stand-up electric truck, a cost-cutter in Yale's line of electric trucks (capacities 1,000 to 200,000 lbs.), call your Yale representative, or write for brochure #5112. The Yale & Towne Manufacturing Co., Yale Materials Handling Division, Philadelphia 15, Pennsylvania, Dept. KT 1-V.



YALE®

INDUSTRIAL LIFT TRUCKS
TRACTOR SHOVELS · HOISTS

YALE & TOWNE

Yale Materials Handling Division, a division of The Yale & Towne Manufacturing Company. **Manufacturing Plants:** Philadelphia, Pa., San Leandro, Calif., Forrest City, Ark.
Products: Gasoline, Electric, Diesel and LP-Gas Industrial Lift Trucks • Worksavers • Warehousers • Hand Trucks • Industrial Tractor Shovels • Hand, Air and Electric Hoists

Circle 175 on Inquiry Card for more data

tact with the water can be red brass or mild steel.

For use with salt water or brackish water, the choice of materials is varied. On installations which do not require adherence to military specifications, the choice of materials is usually inhibited Admiralty tubes, headers, tanks and fins. For military use, the materials are usually cupro nickel for the tubes and headers, Admiralty for the fins and gun metal for the tank castings.

Muddy water, such as is prevalent in rivers or close to shore or in harbors, requires the use of larger diameter tubes, either $\frac{5}{8}$ in. or $\frac{3}{4}$ in. The materials used are of the types used for use with sea or brackish water. Cores made with these larger diameter tubes are available in lengths up to 26 ft, with either plate type fins or spirally wound fins.

The Young Radiator Co. has furnished intercoolers to many of the engine manufacturers for two and four stroke engine air cooling. Some representative installations are as follows:

An intercooler on a four stroke White Diesel engine having low pressure supercharging and using fresh water as the cooling medium. The air is cooled from approximately 170 F down to 112 F using 90 F cooling water. Air pressure is approximately 8 psig, but this pressure spread over the sides gives a force of approximately 2700 lb.

A Worthington engine with an intercooler designed for the low pressure type of supercharging. Fresh water is used for this service. The description given for the White engine setup (above) will apply to this cooler as well.

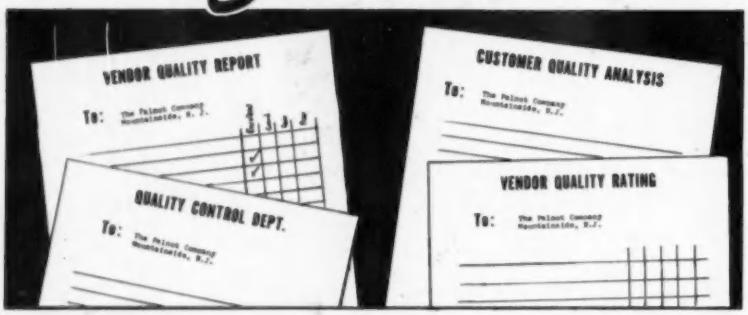
A battery of four Enterprise engines installed on a New York City fireboat. The engines use the low pressure turbocharging system and operating as they do in the New York Harbor, they use sea water as the cooling medium. The intercoolers are constructed of material resistant to the action of salt water, namely Admiralty tubes, headers, fins and tanks.

An intercooler used on a Cooper Bessemer locomotive engine. Water from the radiator is used as the cooling medium. Sufficient cooling is provided to the supercharged air to materially increase the engine horsepower for maximum traction effort by the locomotive. ■

In every Vendor Quality Report—

PALNUT LOCK NUTS consistently rate

"Excellent!"



The Reason? PALNUT QUALITY CONTROL!



Lot after lot, million after million, every PALNUT Lock Nut meets strictest specifications for:

- **Uniform thread fits**
- **Accurate hex forms**
- **Controlled tension characteristics**
- **Uniform dimensions and concentricity**
- **Durable plating and finishing**

These vital requirements are safeguarded by dozens of checks, gaugings and inspections at each step of production, plus final performance-testing to assure easy starting—faster assembly—tightly assembled parts—satisfactory service for users of your products.

Write for Conversion Chart showing all PALNUT Lock Nuts used for automotive assembly.

The Palnut Company, 60 Glen Road, Mountainside, N. J.
Detroit office and warehouse: 780 West Eight Mile Road, Detroit, 20

PALNUT® LOCK NUTS FASTENERS PAL

Quick, secure fastening at low cost

Liquid-Cooled Brake

(*Continued from page* 63)

emergency air.

The BFG brake system is said to have several coincidental attributes. Among those mentioned are:

Spin-up mass is less than for conventional brakes, increasing tire life and imposing reduced stress on landing gear components.

Cool operation prevents damage of tires and wheels; and no excessive heat is carried to wheel well when wheels are retracted.

Lining wear is at a low rate, giving long life and low maintenance. Brakes are self-adjusting.

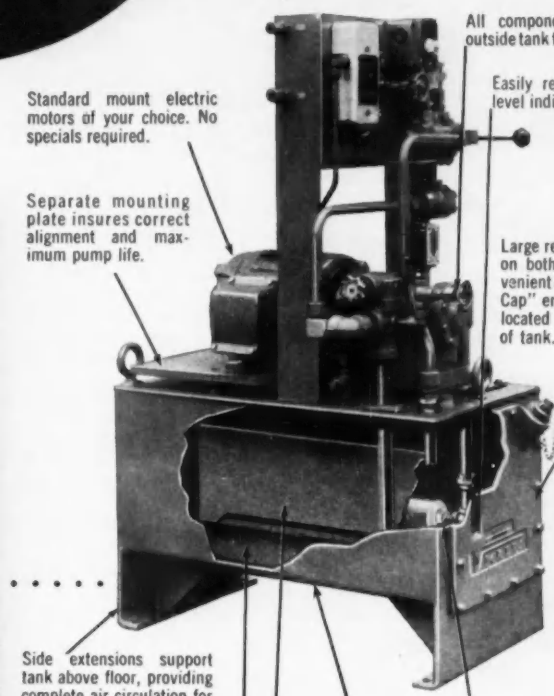
Weight of the complete system involves little or no weight penalty when incorporated into the aircraft during early design stages. ■

Circle 176 on Inquiry Card for more data

Circle 177 on Inquiry Card for more data

You save money and time applying Hydraulics when you buy the . . .

VICKERS *package . . . . . instead of parts*

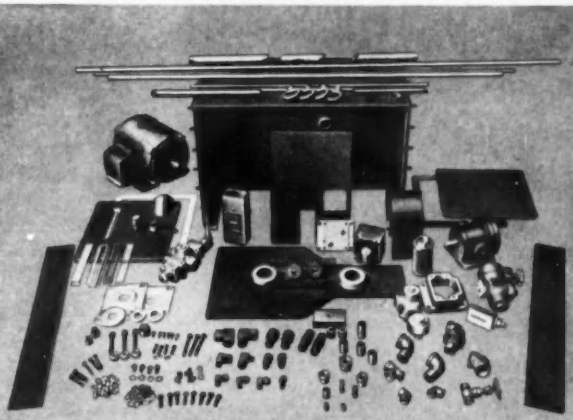


Vickers Custom Built Power Package . . . complete . . . factory pretested . . . ready to connect and operate.

You save time and expense of design, layout, multiple purchasing, and assembly when you buy the Vickers package. You are assured of component compatibility and Vickers undivided responsibility and guarantee for the entire hydraulic package.

A Vickers Custom Built Hydraulic Power Package is a "complete unit" . . . factory pretested, ready for you to connect and operate. Designed and professionally built to your specifications.

Call in a Vickers Application Engineer or write for Bulletin 5001B.



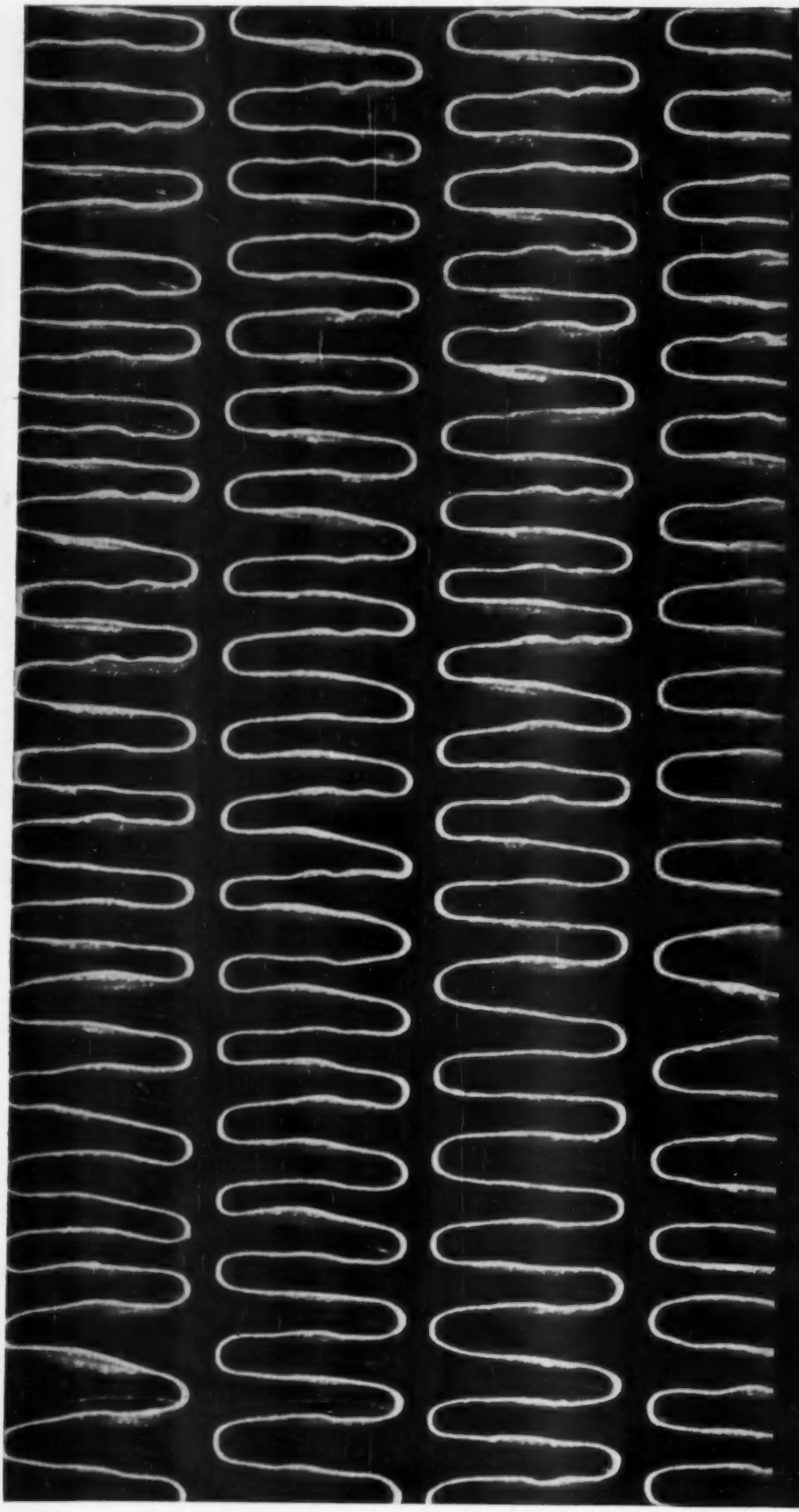
These parts are required to build the Power Package shown above. Purchasing the complete package from Vickers saves you the time and cost of design, assembly, and testing. It also assures the most suitable unit for your particular requirements.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division
ADMINISTRATIVE and ENGINEERING CENTER
Department 1428 • Detroit 32, Michigan

Application Engineering Offices: ATLANTA • CHICAGO* • CINCINNATI • CLEVELAND • DETROIT* • GRAND RAPIDS • HOUSTON • INDIANAPOLIS • LOS ANGELES AREA (El Segundo)* • MILWAUKEE • NEW YORK AREA (Springfield, N.J.)* • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER • ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE* • ST. LOUIS • WORCESTER • Factories also in: Australia, England, Japan and Germany • In Canada: Vickers-Sperry of Canada, Ltd., Toronto,* Montreal and Vancouver
Field Service Headquarters Underlined. Whse. Stock & Repair Branches*.

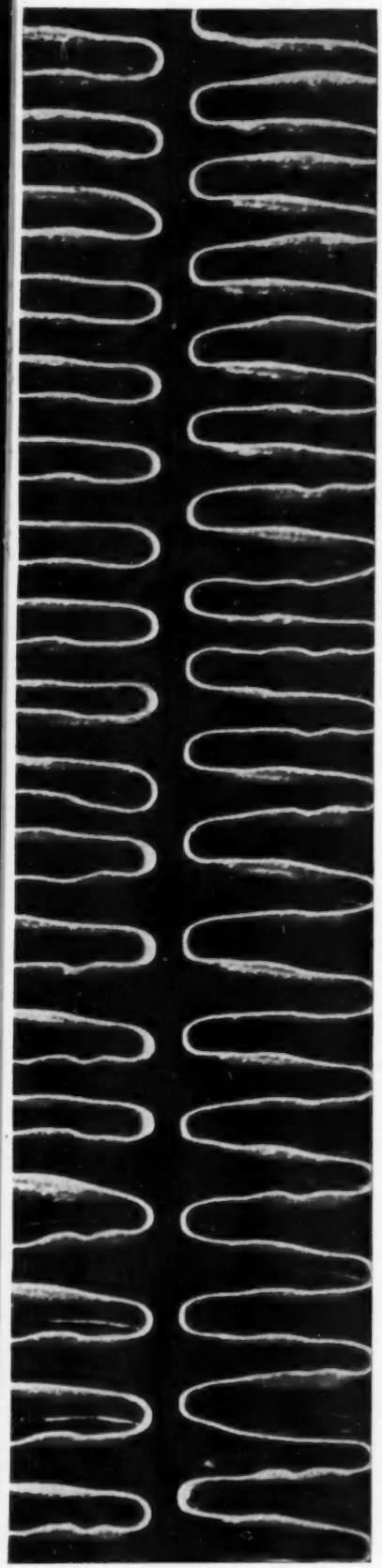
8155

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921



Ready to go... the aluminum radiator

Cuts material costs ...trims front-end weight



The aluminum fin radiator is ready for production lines right now. Years of research and development by Alcoa engineers have proved its performance and dependability. At the moment production changeover can be profitably amortized, aluminum radiators will immediately offer several distinct advantages.

Lower Material Cost—Because you get three times as much metal per pound with aluminum, there is a substantial saving in basic cost—even when other metals are competitively priced on a per pound basis. And additional economies are realized with aluminum.

Reduced Weight—Decreasing the weight of the radiator by one-third or more through the use of aluminum is a major step in the solution of overweight problems in the front end.

Fabrication—Aluminum fin-brass tube radiators are fabricated by the same techniques employed with other metals, using solders specifically designed for aluminum. Several types of organic flux are available. Soldering presents no unusual difficulties in production line applications.



The *all*-aluminum radiator is also a practical reality. Changes in facilities and procedures are required for the brazing operation used for joining tubes, headers and tanks. These changes are justified by the additional economies and improved design characteristics that result.

Let Alcoa Help—Alcoa has over a half century of experience in aluminum research, plus the largest and most complete facilities in the industry. This is available to you in utilizing an all-aluminum radiator and for other applications where aluminum can work for you. Write Aluminum Company of America, Development Division, 1786-A Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM GIVES EVERY CAR MORE GLEAM AND GO

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

Watch "**ALCOA THEATRE**" Alternate Mondays, **NBC-TV**...
"**ALCOA PRESENTS**" Every Tuesday, **ABC-TV**

Circle 178 on Inquiry Card for more data

This can't be FIREBAN...



New Taylor FIREBAN 321 Laminated Plastic is self-extinguishing in only 3 seconds

Electrical faults in appliances, TV sets, radios, motors and other electrical devices frequently lead to fires—and these fires lead to complete destruction of the equipment, sometimes extensive damage to the facilities surrounding it. Taylor FIREBAN 321 is designed to retard fire. Self-extinguishing in only 3 seconds—it is an effective barrier against the spread of flame. In addition, this flame-retardant laminated plastic has excellent moisture resistance, excellent electrical resistance after exposure to high humidity, and good mechanical properties; also offers low dielectric losses. These properties help prevent the electrical faults that lead to fires. Write TAYLOR FIBRE CO., Norristown 49, Pa., for complete details.

Taylor

LAMINATED PLASTICS VULCANIZED FIBRE

Volkswagen Plant

(*Continued from page* 67)

presses are for restriking, then cutting out the full windows and cooling slots. Combined with the three-position shuttle conveyor that follows are two small air punches on each side which cut 0.16-in. holes in the bottom of both glass openings to assist paint drainage from the frames.

The seventh station is the first welding press, where, on the right-hand side of the line, the combined rear window interior reinforcement and engine compartment top is attached to the roof unit. These subassemblies are carried by overhead monorail from the distant shop down to floor level where the operator seated by the press can readily unhook one and place it on the lower die.

Palm switches (interlocked with another operator's on the opposite side) start the upstroke of the die, lifting the roof against the upper electrodes which ring the window frame with 46 spots spaced about 2 in. apart. Work is then returned to the transfer rails and progresses to Station 8, the second welding press, where 18 further spots are added to the rear interior panel. At Station 9, with a similar press, tabs and other small components are located on magnetic fixtures and spotted to the rear interior.

Progressing down the left side of the line, the welding press at Station 7 has a shuttling lower electrode assembly with fixtures for four small brackets, each with an individual high-current contact socket. When these pieces are manually loaded and the palm switches pressed, the electrode platform travels forward and then up, to position the brackets around the interior of the windshield opening. At the same time, the sockets engage their corresponding vertical contact pins beneath the overhanging transformers to complete the welding circuit.

A similar arrangement at Station 8 welds the wiper motor brackets to the base of the windshield surround, and a small interior reinforcement strip is added at Station 9.

At the end of the welding line,

Circle 179 on Inquiry Card for more data

more air reserve for safer braking...

Wagner ROTARY AIR COMPRESSORS

provide rapid pressure recovery to assure ample air at all times



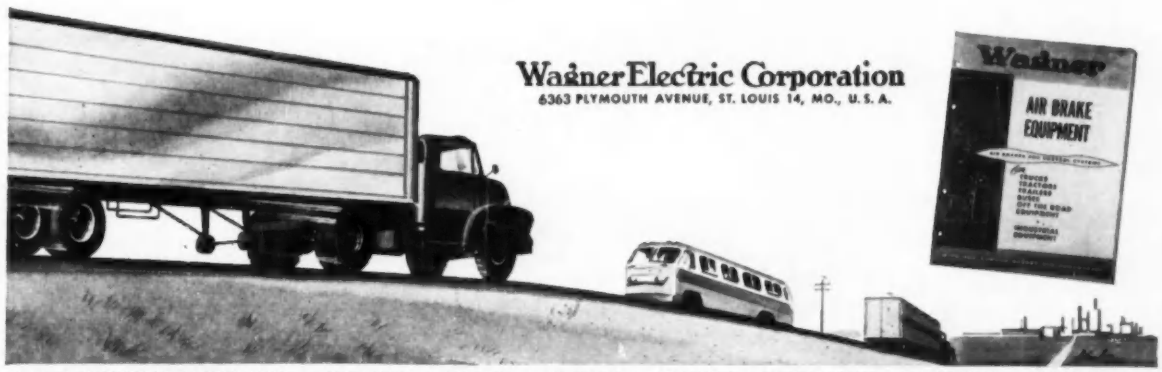
Wagner Rotary Air Compressors have what it takes to deliver a constant and smooth flowing supply of compressed air at all times. Their ability to provide rapid pressure recovery means safer stopping power even under the most severe braking conditions.

Rotary compression forces all air from the compression chamber. Oil and air are separated and cooled before air is discharged to prevent carbon formation in air lines. All rotating parts are turned by the rotor shaft which is suspended on two bearing surfaces to lower friction loss. Uniform torque load with moderate stresses assures smooth, quiet operation with long belt life even at high compressor speeds.

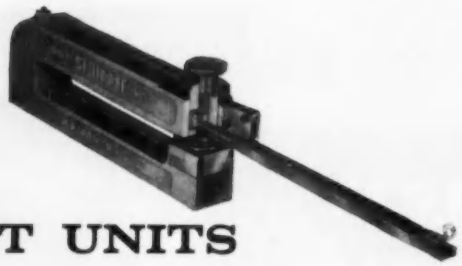
Field tests and fleet records show that Wagner Rotary Air Compressors help keep air brake maintenance costs down. Their exceptionally long service life and easy, infrequent preventive maintenance adds up to greater economy . . . greater performance . . . greater safety. Available in either 9 C.F.M. capacity, air or water cooled; or 12 C.F.M. capacity, water cooled.

For full information about these compressors and details on complete Wagner Air Brake Systems and Equipment for trucks, trailers, tractors, buses and off-the-road equipment, send for your free copy of Wagner Catalog KU-201.

WK59-2

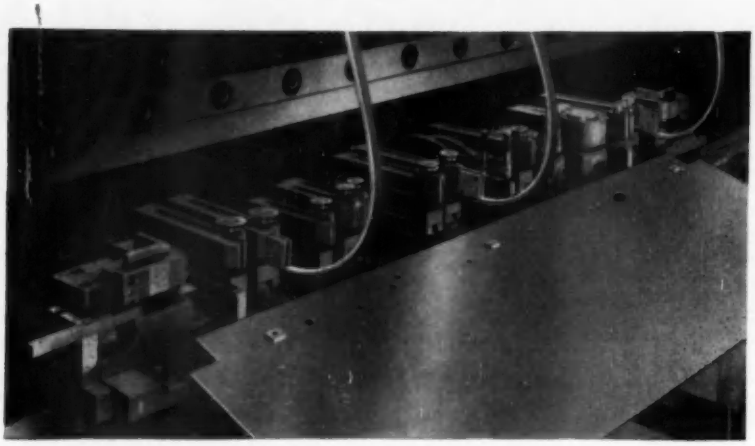


LOCKHEED HYDRAULIC BRAKE PARTS, FLUID and BRAKE LINING • AIR HORNS • AIR BRAKES • TACHOGRAPHS • ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES



NEW STRIPPIT UNITS

. . . stake nuts permanently with every press stroke!



STRIPPIT PIERCE NUT UNITS save operations, time and money in assembly panel production with single-stroke insertion of Fabristeel Multipierce Nuts* into sheet metal up to .125" thick.

Permanent Fastening by an Exclusive New Process—as nut pierces stock, metal flows into nut shoulder slot, becoming an integral part of the stock.

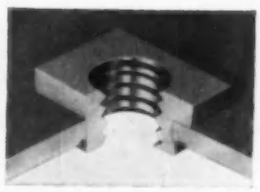
High-Speed—fast press setups, automatic feed of nuts to units for long, medium or short runs gets maximum production per press.

Flexibility—Pierce Nut Units can be quickly press-mounted in any desired pattern, changed on short notice, re-used over and over.

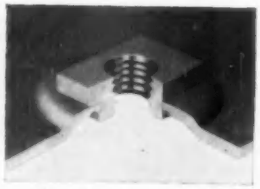
*A Product of Fabristeel Products, Inc.



Each nut is its own punch, a new one each time



Die button causes material to flow into nut slot



Simultaneous embossing for flush fastening

WRITE FOR DEMONSTRATION on your press! The speed and simplicity of Strippit Pierce Nut operation has to be seen to be believed. Also request new catalog for complete specifications.

WALES STRIPPIT INC.

242 Buell Road, Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ontario

A UNIT OF HOUDAILLE INDUSTRIES, INC.

roof assemblies are transferred to a waist-level slat conveyor where there are several positions for visual inspection. Finally the pressings are automatically raised by an 18-ft elevator to an overhead power-and-free monorail which carries them to the main body welding jigs in another part of the building.

The foregoing is Part I of a two-part article. Part II will appear in an early issue of AUTOMOTIVE INDUSTRIES. ■

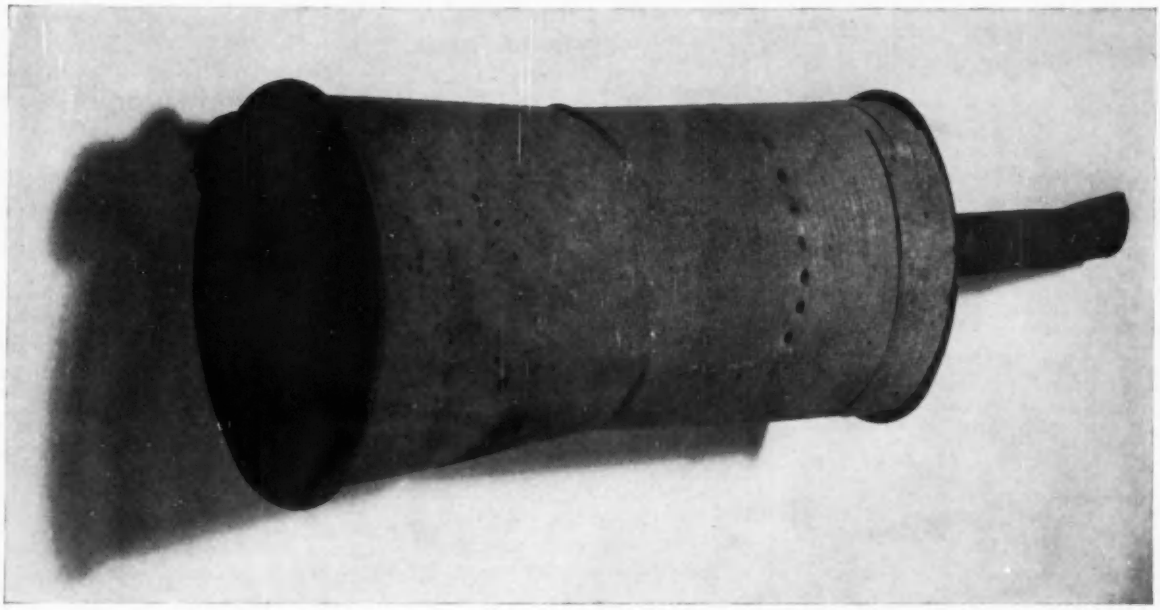
BOOKS . . .

DESIGNING PARTS FOR COLD AND HOT HEADING, *published by Industrial Fasteners Institute, 1517 Terminal Tower, Cleveland 13, O. Price, $2.00.* This new 96-page manual for executives and engineers discusses the economics and design factors involved in heading small parts. Here in one volume for the first time are data on the process and materials used, design studies of headed parts, and "ground rules" for designing items that can be produced most economically by heading processes. Sixty design studies indicate how hot or cold heading saved costs, simplified production, or improved tolerances. Many of the parts studied can undoubtedly be used for other assemblies "as is" or with slight modification.

AIRCRAFT AND MISSILE PROPULSION, *2 vols., by M. J. Zucrow, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, Vol. I, $11.50; Vol. II, $13.00.* The author, professor of gas turbines and jet propulsion at Purdue University, has divided his subject into two broad parts. In the first volume, he deals with the thermodynamics of fluid flow and the application of these principles to propulsion engines. Volume II is a comprehensive treatment of the cycles and performance characteristics of the various types of propulsion engines. The text is generously illustrated with charts and tables.

FLUOROCARBONS, *by Merritt A. Rudner, published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price, $5.75.* This book on the fluorocarbons completely covers their properties, chemistry, processing and fabrication techniques, and final applications. The author discusses the efficient use of these materials and compares them with other plastics. The electrical, mechanical and chemical applications are clearly described. Future uses are discussed from the standpoint of present trends.

VINYL RESINS, *by W. Mayo Smith, published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price, $5.75.* This book thoroughly surveys the applications of vinyl resins against background information on their types, properties, chemistry, manufacture, and fabrication. Every attempt is made to cover all recent advances in the vinyl field. New polyvinyl chloride "pearls" and Delrin resin are included. The treatment of polymerization systems for vinyl chloride is developed in considerable detail. Many items expected to show unusual growth, such as vinyl laminates, rigids, foamed material and latex paints, are brought clearly into focus.



This Auto Muffler Lasted 72 Months

It's Made of Armco ALUMINIZED STEEL

Six years' service life is an excellent record for any kind of muffler. This muffler is of common design. The only thing different about it is the special steel from which it's made—Armco ALUMINIZED STEEL.

Of course, car owners don't always get this kind of life, even from mufflers made of ALUMINIZED STEEL. But actual road tests show that mufflers made from this special hot-dip aluminum-coated steel average at least *twice the life* of their carbon steel counterparts.

HERE'S THE REASON

Superior resistance to combinations of heat and corrosive exhaust gases is the reason why mufflers made of Armco ALUMINIZED STEEL last so much longer. As a result, early failures are reduced. Mufflers are much more likely to span the vital first-owner period.

Here's another important fact: This remarkable steel is available at less cost than any other metal with comparable resistance to a combination of heat and corrosion.

For complete information about this economical steel for longer-lasting mufflers, just fill in and mail the coupon or phone your nearest Armco Sales Office.

Other Armco Steels for top-quality automotive products include Stainless Steels in all forms, ZINCGRIP®, ZINCGRIP PAINTGRIP®, Cold-Rolled PAINTGRIP, Long Ternes, Steel Tubing, and high-quality Hot- and Cold-Rolled sheets.

New steels are born at Armco

ARMCO STEEL CORPORATION, 1149 Curtis St., Middletown, Ohio
Send me more information about Armco ALUMINIZED STEEL Type 1.

NAME

TITLE

FIRM

STREET

CITY ZONE STATE

ARMCO STEEL

ARMCO®

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

(Advertisement)

ADAMS FACT FILE #2

PLANT AIR

Moisture Chief Cause of Trouble . . .

Every company today is looking for ways to offset the increased costs of labor, material, equipment and services. At a gasoline station you expect "Free Air", but in industry it is a major expense. Perhaps in your own plant, for an investment in a few minor compressed air system alterations, significant savings are possible.

Water, sludge, rust, oil and dirt in compressed air systems are prime causes of maintenance and production down-time. Water vapor condensing in air lines tends to corrode the piping. Also, water present in the piping may freeze during winter, causing serious reduction of compressed air supply. Such restrictions are often difficult to locate and thaw. This same line moisture may emulsify lube oil destroying its lubricating value and the resultant mixture has high fouling characteristics. Frequently, ice will form within the tool itself since expanding air cools the moisture . . . tool efficiency will be seriously affected.

Some of the Other Problems Created By Wet Compressed Air . . .

Wet compressed air is not only a construction and production tool problem. Faulty paint jobs, contaminated chemical and food products can often be traced to moisture laden compressed air. Waterhammer, unequal pipeline thermal expansion and line leaks also result from collected moisture. In addition, air lost through traps, and in blow-down of compressed air lines provide no useful work . . . represent a sizeable power loss.

You Can Lick Compressed Air Moisture Problem . . .

All of these hidden costs can be virtually eliminated by the installation of an Adams Aftercooler and Cyclone Separator between the compressor and receiver tank. By cooling discharge air to within 10° F. of cooling water temperature — guaranteed with Adams standard Aftercoolers — the moisture can be removed at the separator. Pressure loss is less than one-half pound on these units including the separator. In severe cases, moisture removal of over 90 per cent can be obtained by cooling the air with Adams 2° Aftercooler to within 2° F. of water temperature.

Air Filter for Final Protection at Point of Use . . .

As an added safeguard for expensive tools and equipment, an Adams Poro-Stone Air Filter should be installed just before the air is used. These filters remove all solid material picked up by the air stream. With an Adams Aftercooler, Cyclone Separator and Air Filters clean, dry, trouble-free air is supplied to your production tools. You get continuous service with minimum maintenance.

For further information on how the complete line of Adams air equipment can solve your compressed air problems, write today for your free copy of Bulletin No. 712 on Aftercoolers and Bulletin No. 117 on Poro-Stone Air Filters from the R. P. Adams Company, Inc., 264 East Park Drive, Buffalo 17, New York.

Circle 183 on Inquiry Card for more data

Harvester's Canadian Plants Will Make Heavy Duty Trucks

International Harvester plants at Hamilton and Chatham, Ont., will produce a line of seven heavy-duty trucks that currently are imported from the United States. The trucks, ranging upward from 30,000 lb, will be powered by Diesel engines built in England by Rolls-Royce.

The new production plan follows a Canadian government request that more goods be bought from Britain to help eliminate Canada's unfavorable dollar trade balance.

MACHINERY NEWS

(*Continued from page* 74)

We need to clearly spell out how this machine tool will reduce costs, increase efficiency and productivity, and why it is a good investment. We must upgrade our proposals to meet the demands of modern buyers. Through this contest we expect to advance the art of preparing machine tool proposals and thereby benefit our customers as well as the builders and distributors of machine tools."

The contest, confined to members of the AMTDA, closes February 23. Winners will be announced, and winning entries displayed, at the Association's spring meeting. The winning entries will also be duplicated for distribution throughout the industry.

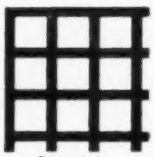
Electrical Standards Analysis Now Available

As a convenience to machine tool builders and users, the Electrical Standards Committee of the National Machine Tool Builders' Association has just completed a study of the essential differences between the Machine Tool (NMTBA) Electrical Standards and those of the Joint Industry Conference (JIC).

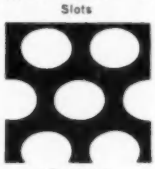
The new four-page report of the NMTBA committee, entitled "Summary of Major Differences," lists and describes 49 basic differences between the two electrical standards. Copies may be obtained

H&K PERFORATED MATERIALS

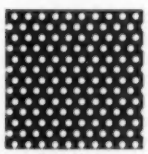
for Industrial or Decorative Uses

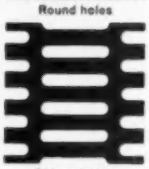

Square holes

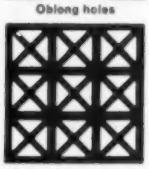

Slots


Oval holes

THOUSANDS OF DIFFERENT PATTERNS AVAILABLE


Round holes


Oblong holes


Decorative patterns

H & K facilities enable the perforating of all metals, wood, plastics and cloth fabrics. Perforated materials can be furnished in sheets, coils, rolls or plates. Fabricating services include shearing, rolling, welding and forming.

Perforated metal can be ordered with special finishes: aluminum—color anodized or brushed and lacquer finish; steel—painted, chrome plated, enameled, japanned or other baked-on finish. Decorative patterns can be embossed if requested.

Many patterns in steel sheets (industrial or decorative) are in stock at our warehouses. Send for H & K Stock List Brochure.

FIND NEAREST H&K AGENT in the Yellow Pages

Listed Under "Perforated Metals"

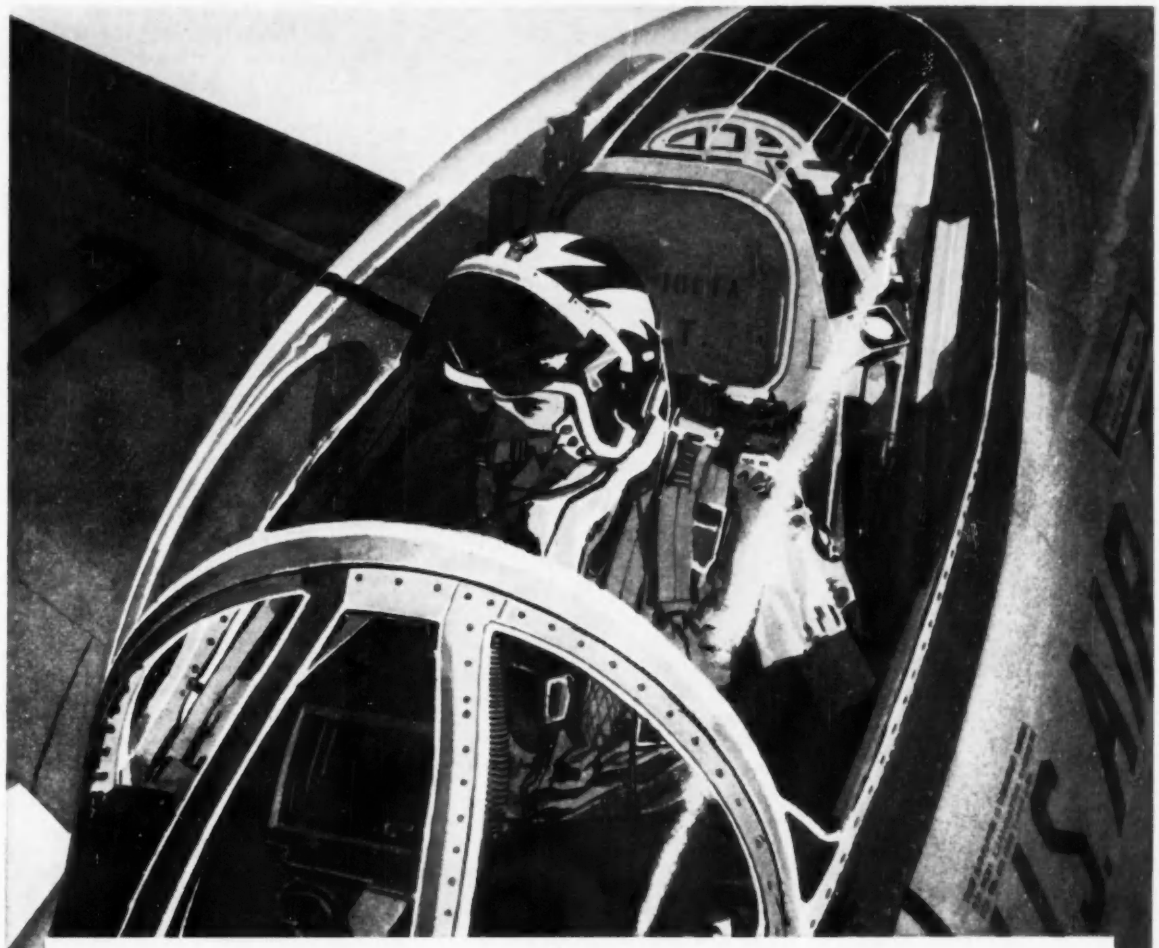
Write to nearest H & K office today—for General Catalog

THE Harrington & King PERFORATING CO. INC.

Chicago Office and Warehouse
5630 Fillmore Street
Chicago 44, Illinois

New York Office and Warehouse
106 Liberty Street
New York, New York

Circle 184 on Inquiry Card for more data



This "bubble" owes its complexion to Polyken® tape

NOT A SCRATCH . . . NOT A DENT . . . THANKS TO THE MODERN METHOD OF SURFACE PROTECTION

The cockpit canopy of a fighter plane can be easily scratched during manufacture. So makers of supersonic aircraft take no chances. They protect its relatively "soft" surface with pressure-sensitive tape.

Not just *any* tape, though. Canopies are too valuable for that. Throughout handling and storage, they're covered with special Polyken tape.

Whatever surfaces you want to protect (from soft plastic to tough steel), there's a Polyken tape that unwinds easier, conforms better, gives superior surface protection, and pulls off clean.

THE MODERN TOOL . . . AT WORK FOR MODERN INDUSTRY



For advice on your surface-protection problem —check with the Polyken Industrial Tape Distributor nearest you, or write to the Polyken Sales Division, 309 W. Jackson Blvd., Chicago 6, Illinois. Dept. AI-1

Polyken

INDUSTRIAL TAPES

THE KENDALL COMPANY
Polyken Sales Division

upon request to the Association, 2071 East 102nd St., Cleveland 6, Ohio.

Around the Industry

Gisholt Machine Co. — recently held a special conference of its sales personnel to acquaint them with the operating features of the CRI-DAN semi-automatic threading lathe. U.S. distribution rights for the French machine were acquired by the company last fall. It uses single-point carbide tools in cutting both inside and outside threads. Advantages demonstrated at the conference included better quality threads, ability to cut hard materials, and cost reductions in specific applications.

McKay Machine Co.—announces the retaining of Max Chilton, Adelaide, Australia, to handle sale of the company's line of special metalworking equipment on the Australian Continent.

Imprex Div. of Ideal Industries—has been re-named **Imprex, Inc.** upon purchase of the division by T. W. Juday, its general manager for the past 4½ years and now its new president. Imprex makes impregnation equipment and sealants used to seal porous castings. ■

AIRBRIEFS

(*Continued from page* 76)

Convertible Aircraft Congress, at Franklin Institute, Philadelphia.

Close to 200 engineers and other aeronautical specialists from Government and industry attended the one-day session.

Since 1950, the Government has sponsored 46 projects, of which 20 got into the hardware stage for flight testing, according to Lt. Col. J. L. Klingenhagen, formerly with the Defense Dept.

In addition, about 12 development projects were privately financed, he said.

During the past eight years, the Defense Dept. has spent over $100 million on convertible aircraft development, $65 million of it in the past three years. ■



FORMULA FOR REDUCED ASSEMBLY COSTS

Take a low-cost fastener like Milford Tubular Rivets. Feed and Clinch with precision Milford Riveters and you multiply the cost savings inherent in tubular rivets. See Milford for all sizes, styles and finishes of tubular rivets... See Milford for a complete riveter line. For the answers to assembly problems *get in touch with Milford first!*

THE MILFORD RIVET & MACHINE CO.

MILFORD, CONNECTICUT • HATBORO, PENNA.
ELYRIA, OHIO • AURORA, ILL. • NORWALK, CALIF.

Circle 186 on Inquiry Card for more data

new tubing bulletin

for designers and engineers



may help you save up to 50% in steel cost by comparing the weight savings of hollow tubing versus solid stock.

By replacing solid rod with tubing in shafting (2¼″ O.D. x .134″ wall) a large blower manufacturer effected a 50% savings in costs. Physical performance remained unchanged. Perhaps you, too, can effect comparable or even greater savings. Write today for this free and important table to reduce steel costs!

STANDARD

THE STANDARD TUBE COMPANY and
MICHIGAN STEEL TUBE PRODUCTS DIVISION
24400 Plymouth Road • Detroit 39, Michigan

Circle 187 on Inquiry Card for more data

BLOOD BROTHERS

Universal Joints

OFFERED BY ROCKWELL-STANDARD IN SIZES FOR ALMOST ANY PRODUCT APPLICATION

SIZES AND TYPES FOR HEAVY-DUTY AUTOMOTIVE, CONSTRUCTION AND ROAD BUILDING MACHINES, FARM IMPLEMENTS, TRACTORS AND INDUSTRIAL MACHINERY.



SAVE ENGINEERING TIME!

Here at Rockwell-Standard, you can select from a wide, wide range of Blood Brothers Universal Joints and complete drive assemblies. Torque capacities range from 350 to 500,000 inch-lbs.—lengths from very close-coupled industrial joints to assemblies 120 inches overall.

You can be confident they are produced in a modern, centrally located plant, tooled for precision manufacturing. And you can rely on their high reputation for dependability.

When you need universal joints and drive lines, you can save valuable engineering time too—by stating your problem to our engineers. They're cooperative, friendly and experienced. *Just write or call.*

WRITE FOR BULLETIN 557

and for your convenience in specifying, request our free Blank Form "Specification Sheets".



ROCKWELL-STANDARD CORPORATION

Blood Brothers Universal Joints

ALLEGAN, MICHIGAN

UNIVERSAL JOINTS
AND DRIVE LINE
ASSEMBLIES

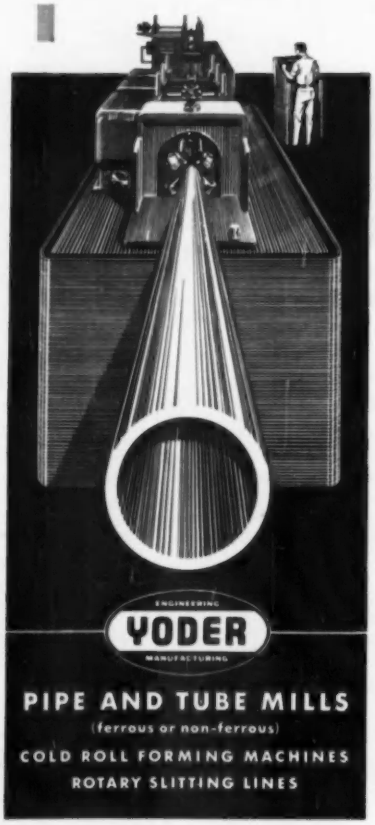
YODER

Pipe and Tube Mills

Product dependability—integrity of manufacture—engineering for specific production needs have all contributed to establish Yoder equipment as the industry standard of excellence. Since 1909 Yoder-built machinery, including Pipe and Tube Mills, Roll Forming Equipment and Rotary Slitters, have earned world-wide customer satisfaction and recognition.

Profit from Yoder's years of engineering and service experience. Send today for the illustrated Yoder Pipe and Tube Mills Book.

THE YODER COMPANY
5553 Walworth Ave., Cleveland 2, Ohio



Circle 189 on Inquiry Card for more data

BUSINESS PULSE

(*Continued from page* 78)

Residential Construction: Expansion in home building has been an important factor in the recovery movement to date, partly because of Governmental stimulation and partly because conditions in capital markets were more favorable to home financing during much of 1958 than in the preceding year. Indications are that 1959 will be a generally active year for the industry, but it may not witness much additional expansion. Capital-market conditions are becoming less favorable to home financing than they were in the first half of 1958 and, significantly, the annual rate of housing starts has recently moved above 1.2 million units, which most analysts think will not be appreciably exceeded in 1959. Housing could well be a neutral factor in the coming year.

Over-All GNP: It is clear that expansive tendencies predominate in the economy at this time and that nowhere is there any serious downward push or the threat of one.

Against this background, prospects are good for steady progress during the year ahead. Conditions do not suggest a runaway boom, but a GNP rate of $475-480 billion (in terms of present prices) seems easily possible by the end of 1959. This range allows for a considerable slowdown from the rate of gain in the latter half of 1958, and it implies a considerably smaller advance than occurred in 1955. It would, however, be sufficient to produce considerably more buoyant conditions in the labor market. ■

Position Wanted

ENGINEERING EXECUTIVE — Competent recognized I/C ENGINE ENGINEER. Highly successful background of engine design, test, development, realistic testing in laboratory and field. Expert engine troubleshooter. Primary experience W/C gasoline H.D. truck engines. Also diesel, automobile, industrial, marine, military. Adept in planning organization, leadership. Early forties, B.M.E. Desires engineering executive position. Resumé delivered upon interview, travel expenses required. Reply Box A.I., 103 Pallister, Detroit 2, Mich.

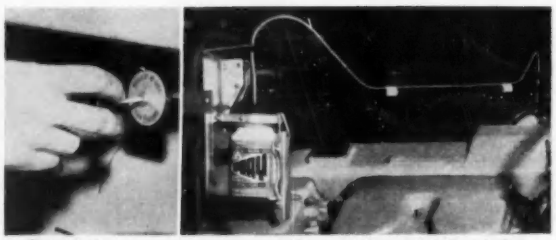
AUTOMOTIVE INDUSTRIES Goes into Leading Plants in the Automotive and Aircraft Industries

PULL THE KNOB AND...

INSTNSTART*

STARTS COLD DIESEL & GASOLINE ENGINES INSTANTLY!

INSTNSTART insures quick starts for cold diesel and gasoline engines all year 'round. (Until an engine reaches normal operating temperature it is a cold engine.) The driver or pilot pulls a knob at his fingertips releasing enough fluid necessary to sustain combustion regardless of weather conditions. INSTNSTART APPLICATORS employ our economical pressurized can of Spray Starting Fluid. This safe, convenient, closed system has been well received in the U. S. and abroad. Quicker starts with INSTNSTART eliminate down-time and prolong engine and electrical system life. It can be installed in minutes with a screwdriver and drill.



*Patent Pending ▲A cover, not shown, protects the mechanism.

SPRAY PRODUCTS CORPORATION
P.O. Box 844 • Camden 1, New Jersey • NOrmandy 3-7040

Circle 190 on Inquiry Card for more data



L. E. Erlewine, Supt. of Motor Maintenance WATSON BROS. says:

"We get 6000 to 8000 miles of EFFECTIVE FILTRATION from a single DIESELPAK"*

Here's powerful proof that superior performance COSTS LESS than ineffective substitutes

Only LUBER-FINER DIESELPAK, with its *exclusive* specially processed media, removes oil contaminants *effectively*—FAR LONGER THAN ANY SUBSTITUTE PACK.

DIESELPAK—designed expressly for use with H.D. detergent compounded oil—removes not only injurious suspended solids, but also colloidal impurities (often more destructive) *without affecting the additives.*

Thus LUBER-FINER DIESELPAK

1. COSTS LESS than ineffective substitutes because it gives MORE MILES of *effective filtration.*
2. Also ADDS THOUSANDS OF MILES to ENGINE AND OIL LIFE because its exclusive engineered protection CLEANS OIL FASTER AND KEEPS IT CLEAN LONGER.

STANDARD AND OPTIONAL EQUIPMENT—On leading Diesel Trucks, Tractors and Stationary Engines.

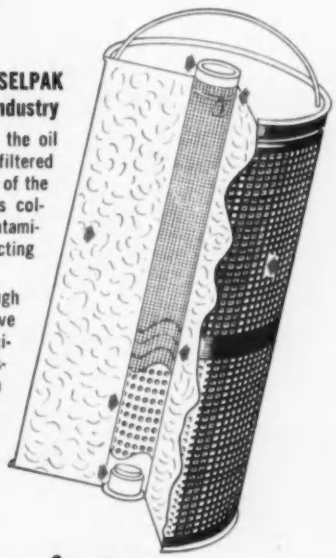
* A typical statement of many users, engineers, and original equipment manufacturers on file.

VISUAL PROOF why DIESELPAK is The Standard of the Industry

Positive end seals prevent the oil from by-passing. The oil is filtered through the patented media of the DIESELPAK which removes colloidal particles and other contaminants without adversely affecting the additives.

The oil then passes through several layers of protective fibrous material which is scientifically engineered to positively prevent media from migrating into the engine.

World renowned engineered protection is enjoyed only by the users of the genuine LUBER-FINER "DIESELPAK."

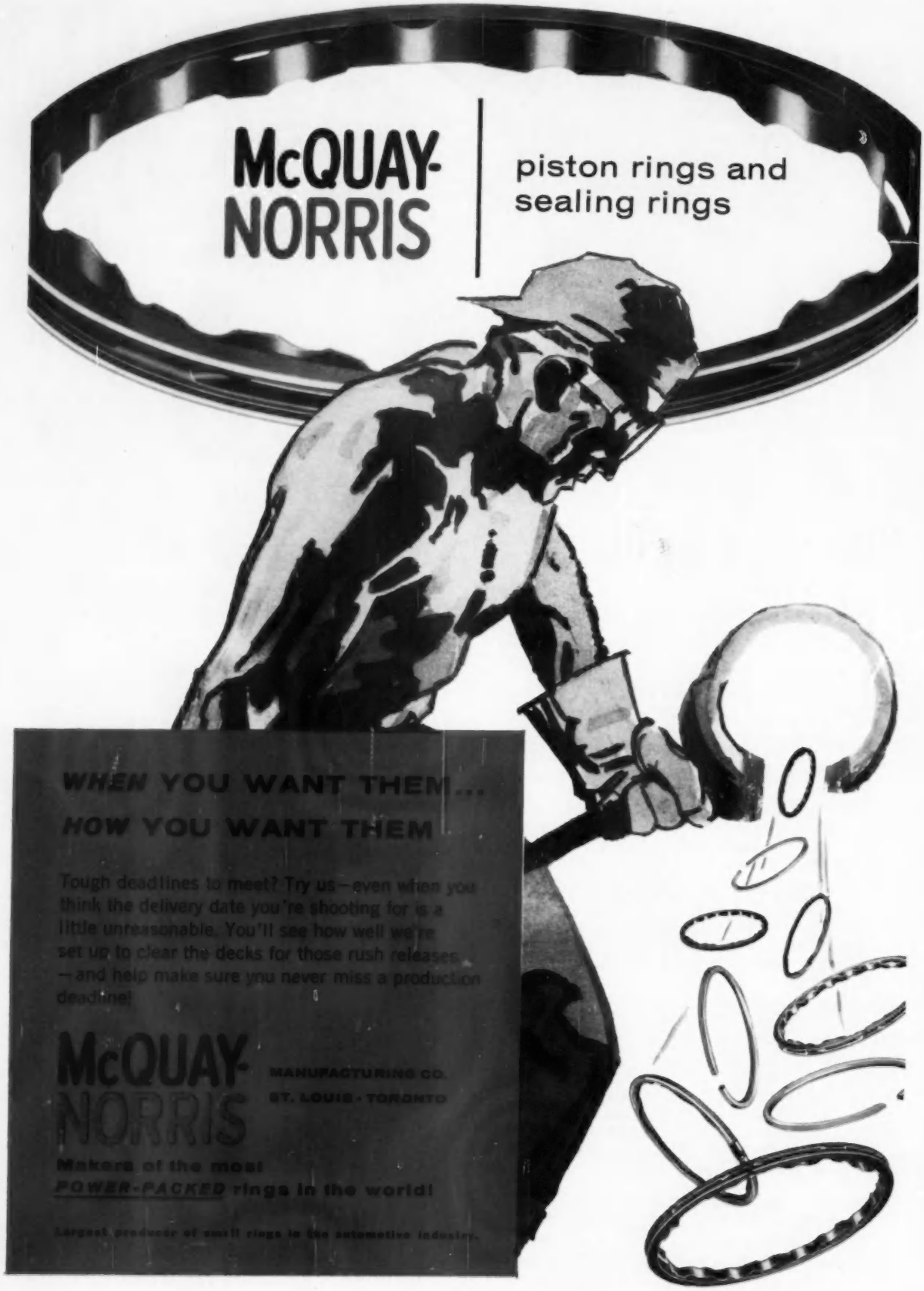


Luber finer

WRITE FOR INFORMATION—how to get MORE MILES of effective lubrication at LESS COST. Dept. A-1.

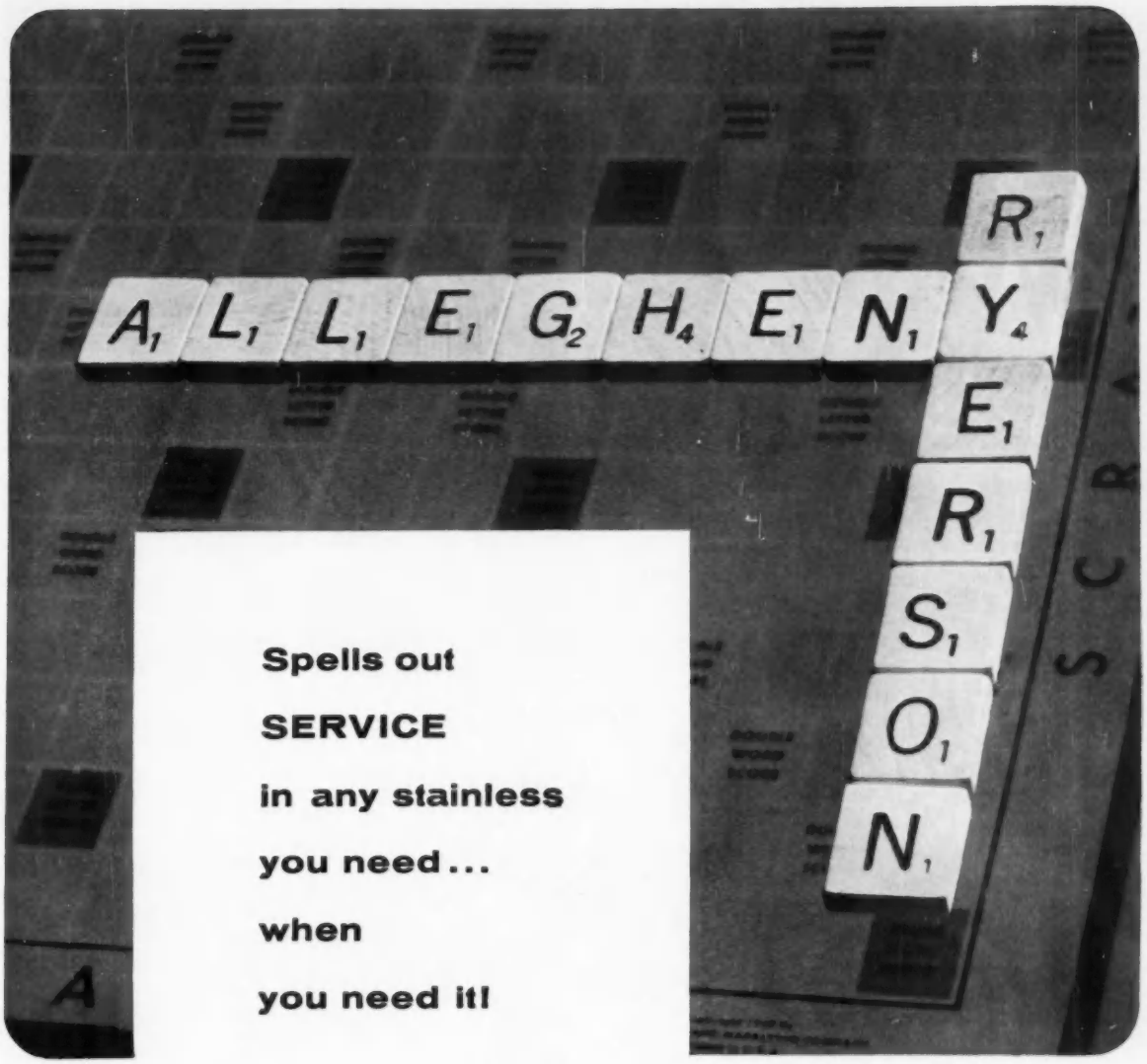
LUBER-FINER, INC.
2514 South Grand Avenue, Los Angeles 7, California

Circle 191 on Inquiry Card for more data



Circle 192 on Inquiry Card for more data

Experience**—the extra alloy in **Allegheny Stainless



You can win only when you buy Allegheny Stainless from Ryerson. Two top names are teamed to give you quality stainless, the fastest way possible!

Allegheny Ludlum is the leading producer of stainless steels in all forms. Ryerson is recognized as the top steel service center. It's a team to bring you the best quality stainless, quick, when you need it.

Ryerson now stocks 2,351 shapes, sizes, finishes and alloys of Allegheny Stainless. It's the most complete line of stainless anywhere! And Ryerson takes the inventory cost from you, gives you as quick service as your own stockroom.

Whether your order is for Allegheny Stainless sheet, plates, bars, or whatever, Ryerson has it in stock. Trained salesmen and technicians to help in selecting or in fabricating are at your beck and call.

For top quality Allegheny Stainless from warehouse stocks, call Ryerson. ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.***

WSW-7126

ALLEGHENY LUDLUM

for warehouse delivery of Allegheny Stainless, call RYERSON

Export distribution: AIRCO INTERNATIONAL

EVERY FORM OF STAINLESS . . . EVERY HELP IN USING IT

design with assurance!

Cycolac can work design wonders for you. Extensively used in a host of end-use products similar to those illustrated here, Cycolac can help you design finer, more attractive-looking products—premium quality merchandise that stresses sturdiness, easier assembly, faster production and lower costs. Yes, to design it with full assurance, specify Cycolac.



CYCOLAC®

HIGH-IMPACT THERMOPLASTIC RESIN

...molded parts, extruded profiles, calendered sheets.

This family of single uniform resins provides a unique balance of properties, permitting fast molding, calendering and extruding. It is economical to form Cycolac press-polished sheets by vacuum, air-pressure, or mechanical methods over inexpensive molds of wood, plaster, aluminum, etc.

Write for latest technical data today!

PACESETTER IN

Marbon CHEMICAL

SYNTHETIC RESINS

Division of BORG WARNER • Washington, W. Va.

also represented by:

WEST COAST: Harwick Standard Chemical Co., Los Angeles, Cal.
CANADA: Dillons Chemical Co. Ltd., Montreal & Toronto
EXPORT: British Anchor Chemical Corp., New York

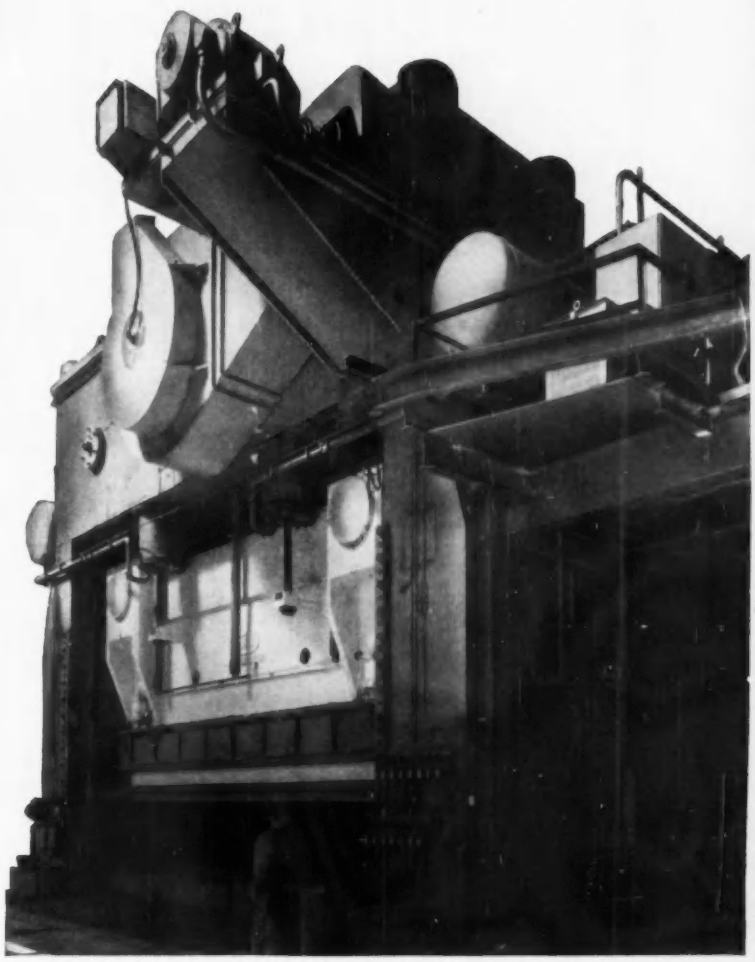
BW

Marbon

Circle 194 on Inquiry Card for more data

Circle 195 on Inquiry Card for more data

Deflection .0013" Per Foot—Parallelism .00025" Per Foot Over 40 Feet in this Giant 4000-Ton Press Produced by DANLY for A. O. Smith Corporation



Side members for truck frames are stamped out in sizes up to 40 feet in length for the heaviest duty trucks in this 4,000-ton Danly press at the Milwaukee Plant of the A. O. Smith Corporation. The press slide comes down once and a heavy-gauge steel "sidebar" is ready for assembly. The press operating rate is 10 strokes per minute.

The bed deflection .0013" per foot—measured and tested by A. O. Smith engineers—required a bed so massive that it had to be made in two halves along the right to left center line, to stay within transportation limits. The halves are tie-rodded and keyed together.

The cushions, placed in the bed opening, are so constructed that they will absorb any extremes of off-center loading.

The bed surface and slide each machined at one setting—checked out flat and parallel within .009" over the 40 ft. length representing a parallelism bed to slide .00025" per foot.

The Danly Microinching Drive will move the slide through an entire cycle at slow speed for die setting and produce an accurate part without stopping the flywheel and deliver full-rated capacity of the press.

The extremes of weight, size and accuracy of welded-steel fabrication and machining represented in this press were achieved by the combination of heavy handling equipment including 100-ton Whiting Cranes and the 7" Giddings & Lewis Horizontal Bars mounted on 100 ft. runways in Danly's new facilities.

The press is now operating. It is reflecting the accuracy of manufacture to its great size by stamping accurate parts in daily production.

This press was designed specifically for, and in cooperation with, A. O. Smith Corporation, pioneers in efficient production and leading supplier to the automotive industry . . . by Danly, the leading supplier of stamping equipment to the automotive industry.

This press typifies Danly's ability to work with you to design, engineer, and produce new presses for new applications to increase capacity, lower stamping costs, lengthen die life, and reduce downtime. Find out how.

WRITE FOR CATALOGS that interest you on:
Danly O. B. I. Presses • Straight Side Presses
Autofeed Presses • Double-Action Straight Side Presses
Underdrive Presses • Quick Die Change Presses
. . . as well as accessories and controls

DANLY 4000 TON STRAIGHT SIDE PRESS

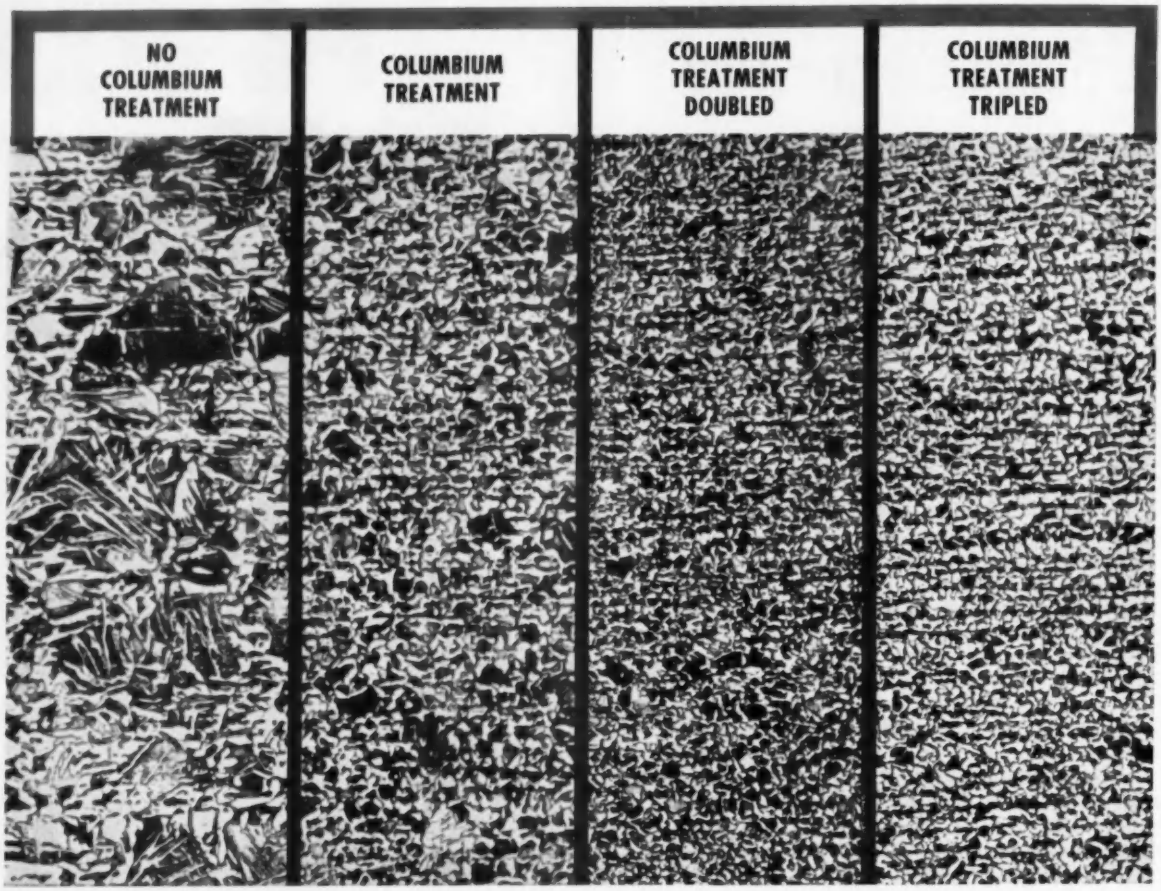
Tonnage	4000 at 1/2" up; 2500 at 5" up		
Bed size	480" x 60"	Stroke	22"
Slide	480" x 42"	Strokes per minute	10
Shutheight	48"	Points of connection	4

The Leading Supplier to the Stamping Industry

DANLY MACHINE SPECIALTIES, INC. DANLY 2100 S. Laramie Ave. • Chicago 50, Illinois

MECHANICAL PRESSES • DIE SETS • DIE MAKERS' SUPPLIES

HOW GREAT LAKES



Composite of photomicrographs made from the same heat of mild carbon steel shows the effect of varying columbium treatments on the grain structure of the steel.

The Great Lakes Family of High-Strength Steels

N-A-X FINEGRAIN STEEL

Lets you design superior performance, longer life and less weight into your product. Many diversified applications.

N-A-X HIGH-TENSILE STEEL

Offers all the characteristic features of N-A-X Finegrain, plus greatly enhanced resistance to atmospheric corrosion.

GLX W

A series of fine grained, mild carbon steels. They have unusually high strength, toughness and weldability.

N-A-X N-A-XTRA STEELS

Quenched and tempered steels of excellent weldability and toughness, with yield strengths from 75,000 - 110,000 psi.

N-A-X HIGH MANGANESE STEELS

N-A-X High Manganese and High Manganese Special Killed. These steels give yield strengths up to 50,000 psi.

STEEL CORPORATION'S NEW GLX-W STEELS GIVE ... HIGH STRENGTH TOUGHNESS REDUCED COSTS

Key to the success of Great Lakes' new GLX-W Series of steels is the fine grained internal structure produced by treatment with columbium. This grain refinement also contributes to ductility. And in addition, the GLX-W Series' low carbon and manganese content assures excellent weldability with freedom from underbead cracking under all conditions.

COST AND WEIGHT SAVINGS

Where design permits the replacement of carbon steel with GLX-W steels, weight savings of 20 to 35 per cent, and cost savings of 10 to 25 per cent can be realized. When replacing alloy steels the cost savings can range from 25 to 35 per cent. These steels feature higher yield strengths, greater tensile strengths and increased toughness without costly heat treatments or extensive alloy additions.

The GLX-W Series is so priced that substantial cost reductions can be obtained by weight reduction over mild carbon steel. Cost reduction can also be obtained over alloy steels because of the lower price of GLX-W steels.

STRONGER AND TOUGHER

GLX-W steels are stronger and tougher than ordinary mild carbon steels and in some applications can do the job now being done by the more costly alloy steels.

MANY USES FOR GLX-W STEELS

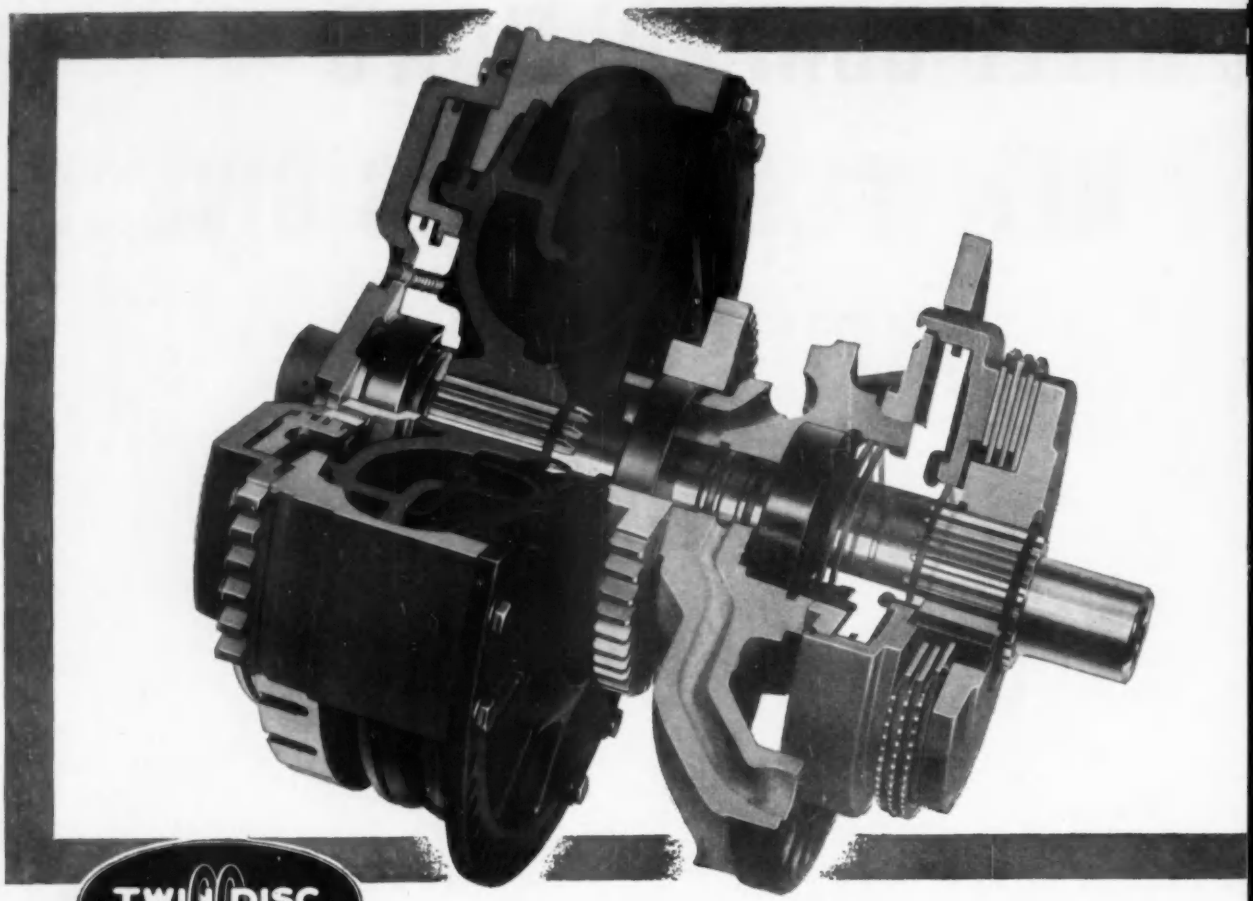
GLX-W steels are especially recommended for a broad range of applications in mobile equipment and pressure vessels, as well as the transportation and construction fields.

GLX
W

For additional technical information about these economical GLX-W steels write

Product Development Division, Dept. J-1
GREAT LAKES STEEL CORPORATION
Detroit 29, Michigan • Division of
NATIONAL STEEL CORPORATION

Circle 196 on Inquiry Card for more data



New Single-Stage Stripped Torque Converter

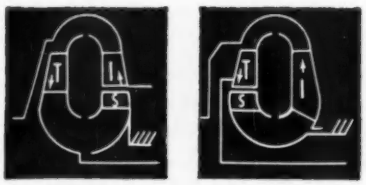
Efficiency, adaptability, long life — all in one low-cost package — that's the new Twin Disc 1100 Series Torque Converter. It's furnished as a "stripped" unit to be designed into any drive line of appropriate capacity. Wherever mild torque conversion is desired — shovels, cranes, tractors, materials handling equipment — this new unit provides compactness and low cost without sacrificing heavy duty construction.

The 1100 Series is rated for engines producing up to 188 hp at 3700 rpm and up to 265 lb.-ft. of torque. Five torque ratings permit close matching of converter to engine for maximum efficiency and fuel economy.

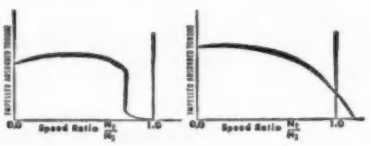
Other torque converter advantages: Cushions out shocks and vibrations . . . eliminates lugging and stalling . . . automatically matches power to load demands . . . permits delicate holding and inching under power . . . minimizes gear shifting.

Considerable design latitude is provided by two optional circuit designs (see torque characteristics at right).

This new "stripped" single-stage converter enables original equipment manufacturers to offer the sales appeal of torque converter drives at the lowest possible cost. For single-stage units with higher capacities, Twin Disc also offers the 1300 and 1500 Series Torque Converters.

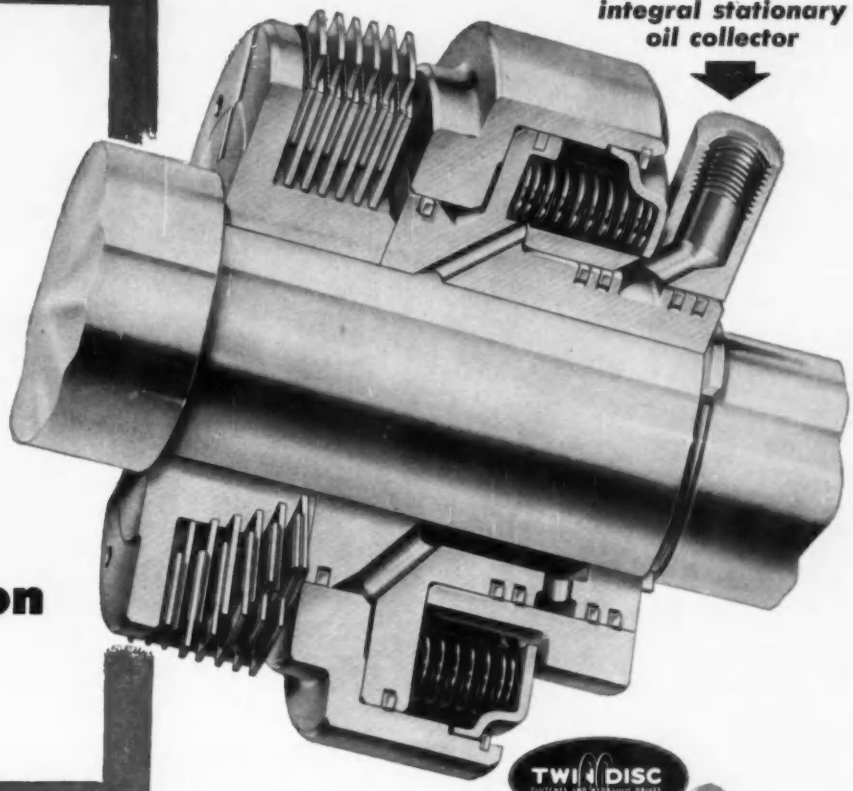


Schematic drawings of the two types of single-stage circuits. The Type 1 (outflow) circuit is at left. Type 6 (inflow) is at right.



A comparison of the torque characteristics of the Type 1 circuit (left) and the Type 6 circuit. The Type 1 circuit unloads the engine quite abruptly at a speed ratio of about .825. The Type 6 design allows a no-load speed ratio of 1.15:1.

Design either or both of these new units into your transmission



TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC
Friction Clutches and Fluid Drives

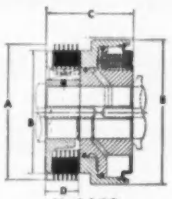
New Oil-Actuated Multiple-Plate Clutches

Clutch failures and burn-outs are virtually eliminated in these new wet-type Twin Disc Clutches. No adjustments are needed because ram travel compensates *automatically* for plate wear.

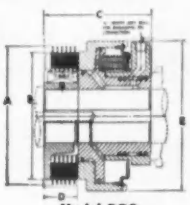
Designed for machine tools and similar applications, these units are built to run in oil and are actuated by oil pressure of 100 to 300 psi. Model DOC (shown above) has an around-the-shaft oil collector connected by a 1/4" line. Model DO is identical except that the oil collector is omitted, shortening the clutch somewhat.

Compact design, smooth performance, long wear—with no adjustment problems—these benefits are available *now* in Twin Disc Oil-Actuated Multiple-Plate Clutches. Write for full details.

Twin Disc Clutch Company, Racine, Wisconsin. Hydraulic Division, Rockford, Illinois.



Model DO



Model DOC

Model No.	Torque Capacity Lb.-ft.	Hp Capacity	Max. Allowable Rpm		A	B	C (length)	D	E
			With Hydraulic Balance	Without Hydraulic Balance					
DO 403	37	9	5000	2700	3.31	3.00	2.580—2.566	1.02	3.80
DOC 403			5000	3480			3.500—3.486		
DO 403½	95	20	5000	2680	3.81	3.50	2.892—2.872	1.17	4.42
DOC 403½			5000	3500			3.780—3.766		
DO 604	130	31	5000	2670	4.38	4.00	3.255—3.241	1.26	4.80
DOC 604			5000	3660			4.160—4.142		
DO 605	330	58	4500	2270	5.50	5.00	3.447—3.429	1.35	5.90
DOC 605			4500	3070			4.267—4.249		
DO 706	435	100	3750	1815	6.56	6.00	3.981—3.963	1.60	6.90
DOC 706			3750	2560			4.822—4.804		
DO 707	690	137	3250	1790	7.62	7.00	4.697—4.679	2.12	8.00
DOC 707			3250	2550			5.540—5.522		

Circle 197 on Inquiry Card for more data

puts that "want-to-buy" gleam in their eye



UNILOY
STAINLESS STEELS

The gleam in *her* eye reflects the brilliant beauty of stainless steel trim. The gleam in *his* eye reflects the protection that only stainless steel provides. Helps keep that "showroom look" for years.

Specify Uniloy stainless steel, produced by steelmakers who have been making specialty steels since 1884. This backlog of experience explains Uniloy's gleaming finish, why it is so easy to fabricate. For prompt delivery of Uniloy stainless steel rolled to your exact specifications, write or call our nearest sales office or warehouse.

UNIVERSAL CYCLOPS
STEEL CORPORATION
BRIDGEVILLE, PA.

STAINLESS STEELS • TOOL STEELS • HIGH TEMPERATURE METALS

Circle 198 on Inquiry Card for more data

Circle 199 on Inquiry Card for more data →

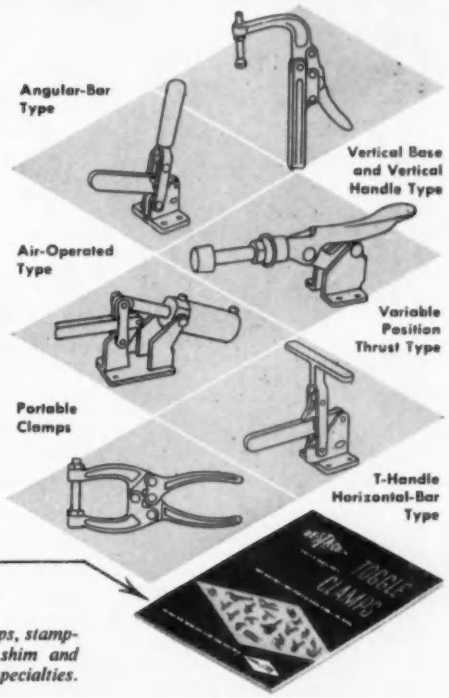


Where It's Quality, Quality, Quality!
It's Quality DE-STA-CO Toggle Clamps

FINAL INSPECTION OF ROSS OPERATING VALVES subjects every valve to a pressure test far exceeding its normal usage. For over fifteen years, fixtures similar to this, all employing De-Sta-Co No. 620 plunger clamps, have been built to do this critical high pressure sealing job.

Whether your holding and clamping operation is inspection, machining, tapping, grinding, welding, bonding or other assembly, there is a specific De-Sta-Co Toggle Clamp to do it better. Fast action, positive clamping, long life through thousands of production operations have made De-Sta-Co known for almost 30 years as the leading tool in the field. And all of our medium and larger models use hardened serrated pins in hardened bushings staked to prevent wear. A broad selection of spindle accessories increases the versatility of the clamp you specify.

Our representative in your area is qualified and ready to serve you. Send for our catalog showing clamp applications, scale drawings and complete information.



DE-STA-CO

ORIGINATORS OF PRODUCTION CLAMPING

De-Sta-Co is widely known for toggle clamps, stampings, precision washers, spacers, shims, shim and feeler stock, blower housings and marine specialties.

DETROIT STAMPING COMPANY

297 MIDLAND AVENUE · DETROIT 3, MICHIGAN

VELLUMOID

USE THE FINEST!

Specify Vellumoid for the finest in gaskets and gasket sets . . . job matched to your specific requirements. Vellumoid now offers Cylinder Head, Manifold, Exhaust Flange Gaskets and Overhaul Sets to assure trouble-free superior performance.

Ask your jobber about Coppermoid . . . He knows quality.

THE VELLUMOID COMPANY

Worcester, Massachusetts

Circle 200 on Inquiry Card for more data

USE SILICONE LUBRICANTS

TO STOP OIL DRIP IN OVEN HEAT



Protect your product finishes against dripping oil . . . reduce rejects, end waste with high-temperature Dow Corning Silicone Greases. Silicones "stay put" even in the hottest baking ovens . . . won't thin out, oxidize or gum up.

It's the money-saving way to lubricate bearings, bushings, cams, gears, valves and other moving parts at any temperature up to 450 F.

Send for FREE BOOKLET on how silicone greases can help you improve lubrication on a reduced maintenance schedule. Address Dept. 0613

first in silicones

Dow Corning CORPORATION

MIDLAND, MICHIGAN

Circle 202 on Inquiry Card for more data

Quantity PRODUCTION of GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY

FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS

CHATTANOOGA 2, TENNESSEE

Circle 201 on Inquiry Card for more data

DYKEM STEEL BLUE

Stops Losses making Dies and Templates



Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

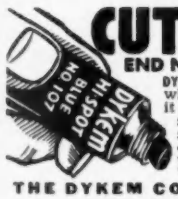
THE DYKEM COMPANY

2301-L North 11th St. • St. Louis 6, Mo.

Circle 203 on Inquiry Card for more data

CUT SCRAPER TIME

END NIGHT CLEANUP & MORNING REBLUING



DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO.. 2301-L NORTH 11TH ST., ST. LOUIS 6, MO.

Circle 204 on Inquiry Card for more data

AUTOMOTIVE INDUSTRIES

Readers are always well Informed.

Take a short-cut to better, more efficient power transmission with Spicer Needle Bearing Universal Joints



Spicer's skill in producing and applying universal joints has solved more than 30,000 drive design problems in the last half century.

For instance, the first universal joint to be used in aircraft . . . and to meet the highest standards of aircraft quality . . . was supplied by Spicer.

The first rubber cushioned joint was designed by Spicer specifically for applications such as dynamometers where dynamic balance is critical. And, you'll find Spicer Universal Joints and Spicer design in evidence in almost every American made passenger car.

If you're working on the average drive design you probably don't need a revolutionary new idea in universal joint design. All you may need is a little expert help. You can get either . . . or both . . . and gladly, from the Spicer engineer. Give him a call today and put his specialized knowledge to work solving your drive problems.



IT'S FREE *Write today for your free copy of Spicer Needle Bearing Universal Joints Bulletin No. 233. And the next time you have any type of problem in designing with propeller shafts and universal joints, call the Dana Engineer. He can help you in a variety of ways.*

DANA CORPORATION • Toledo 1, Ohio

DANA
Spicer

DANA PRODUCTS Serve Many Fields:

AUTOMOTIVE: Transmissions, Universal Joints, Propeller Shafts, Axles, Powr-Lok Differentials, Torque Converters, Gear Boxes, Power Take-Offs, Power Take-Off Joints, Clutches, Frames, Forgings, Stampings.

INDUSTRIAL VEHICLES AND EQUIPMENT: Transmissions, Universal Joints, Propeller Shafts, Axles, Gear Boxes, Clutches, Forgings, Stampings.

AVIATION: Universal Joints, Propeller Shafts, Axles, Gears, Forgings, Stampings.

RAILROAD: Transmissions, Universal Joints, Propeller Shafts, Generator Drives, Rail Car Drives, Pressed Steel Parts, Traction Motor Drives, Forgings, Stampings.

AGRICULTURE: Universal Joints, Propeller Shafts, Axles, Power Take-Offs, Power Take-Off Joints, Clutches, Forgings, Stampings.

MARINE: Universal Joints, Propeller Shafts, Gear Boxes, Forgings, Stampings.

Many of these products manufactured in Canada by Hayes Steel Products Limited, Merrittan, Ontario.

Index to Advertisers

This Advertisers' Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

A

AC Spark Plug, Electronics Div. 90
AMP Inc. 48
Adams Co., Inc., R. P. 130
Aetna Ball & Roller Bearing Co. 109
Alemite Div. Stewart-Warner 27
Allegheny Ludlum Steel Corp. 137
Aluminum Co. of America
Development Div. 124-125
American Chain & Cable Co. 118
Armco Steel Corp. 129
Automotive & Aircraft Div. 118
Auto Radiator Mfg. Co. 100

B

Babcock & Wilcox Co.
Tubular Products Div. 2
Baush Machine Tool Co. 89
Bendix Aviation Corp.
Zenith Carburetor Div. 10
Bendix - Westinghouse Automotive
Air Brake Co. 34-35
Binks Mfg. Co. 102
Borg & Beck Div. 93
Bundy Tubing Co. 28-29
Burton Auto Spring Corp. 77

C

Carter Carburetor Div. 49
Central Foundry Div. 12-13
Chicago Screw Co. 119
Classified Advertisement 134
Continental Motors Corp. 105
Controls Co. of America 47
Copperweld Steel Co.
Superior Steel Div. 17
Crucible Steel Co. of America 103

D

Dana Corp. (Spicer) 147
Danly Machine Specialties, Inc. 139
Delco-Remy Div. 22-23
Detroit Stamping Co. 145
Dow Corning Corp. 146
Dykem Co. 146

E

Enjay Co., Inc. 1

F

Fairfield Mfg. Co. 114
Federal-Mogul-Bower Bearings, Inc.
Bearings Co. of Amer. Div. 25
Federal-Mogul Div. 33
National Seal Div. 50
Fuller Mfg. Co. 99

G

Garrett Corp.
AiResearch Industrial Div. 18
Gisholt Machine Co. 24
Goshen Rubber Co., Inc. 92
Great Lakes Steel Corp. 140-141
Greenlee Bros. & Co. 9

H

Harrington & King Perforating Co. . 130
Heald Machine Co. ..... 2nd Cover
Holley Carburetor Co. 115

J

Johnson Products, Inc. 110
Jones & Laughlin Steel Corp. 117

K

Kelsey-Hayes Co. 86
Kendall Company
Polyken Sales Div. 131

L

Lamb Electric Co. 88
La Salle Steel Co. 111
Lilly & Co., Eli 14-15
Lindberg Engineering Co. 30-31
Luber-Finer, Inc. 135

M

McLouth Steel Corp. 85
McQuay-Norris Mfg. Co. 136
Mallory & Co., Inc., P. R. 75
Marbon Chemical Div. 138
Midland-Ross Corp. 26
Milford Rivet & Machine Co. 132
Minneapolis-Honeywell 32
Molded Fiber Glass Body Co. 5
Moline Tool Co. 106

N

National Seal Div. 50
New Britain Machine Co.
New Britain-Gridley Machine Div.
19-20

O

Oakite Products, Inc. 98

P

Palnut Company 122
Pangborn Corp. 46
Parker Rust Proof Co. 104
Pennsalt Chemicals Corp. 107
Pioneer Aluminum, Inc. 51

R

Republic Steel Corp. 94-95
Rivett, Inc. 11
Rochester Products Div. 101
Rockford Clutch Div. 120
Rockwell-Standard Corp.
Blood Brothers Universal Joints . 133
Brake Div. 112-113
Ryerson & Son, Inc., Jos. T. 36

S

Sanborn Company
Industrial Div. 21
Sealed Power Corp. 79
Seibert & Sons, Inc. 116
Southern Screw Co. 91
Spray Products Corp. 134
Standard Tube Co. 132
Stewart-Warner Corp. Alemite Div. 27
Strom Steel Ball Co. 8
Sun Oil Co.
Industrial Products Dept. 7
Superior Steel Div. (Copperweld
Steel Co.) 17

T

Taylor Fibre Co. 126
Timken Roller Bearing Co.
Back Cover
Torrington Company 73
Tung-Sol Electric, Inc.
Electroswitch Div. 16
Twin Disc Clutch Co. 142-143

U

Universal Cyclops Steel Corp. 144

V

Vellumoid Co. 146
Vickers, Inc. 123

W

Wagner Electric Corp. 127
Wales Strippit, Inc. 128
Wausau Motor Parts Co. 96-97
Western Felt Works 6
Wheland Co. 146
World Bestos Div.
Firestone Tire & Rubber Co. 108

Y

Yale & Towne Mfg. Co.
Yale Materials Handling Div. 121
Yoder Company 134

Z

Zollner Corp. ..... 3rd Cover

FREE LITERATURE

Silicone Products 1

The 1959 reference guide to Dow Corning silicone products describes what silicones can best meet the needs of a variety of problems ranging from adhesives to release agents, resins to rubbers, dielectrics to water repellents. Contains 16 pages. *Dow Corning Corp.*

Forming Machine 2

A four page bulletin describes the Comet Rotary-Vac 3 stage forming machine for plastic vacuum forming. *Comet Industries.*

Precision Gears 3

High-performance precision gears from less that one inch to over 200 inches in diameter and with tooth-to-tooth spacing accuracies of two ten-thousandths of an inch are described in Bulletin GEA-6430. *General Electric Co.*

Boring-Reaming Tools 4

Rough and finish boring and reaming tools for the metalworking industry are described and illustrated in an 18 page catalog prepared by *Muskegon Industries, Inc.*

Precision Jig Borer 5

Details and features that make the Model 3 Moore precision jig borer capable of locating and boring holes to less than a "tenth" are presented in a two-color brochure. *Moore Special Tool Co., Inc.*

Fastener Data 6

All basic engineering data and specifications are included on hexagon nuts sizes ¼ to 3 in.; 12 Pointer nuts sizes ¼ to ⅝ in.; "Conelok," "Huglok" and "Marsden" locknuts sizes ¼ to 1½ in. in an eight page catalog released by *National Machine Products Co.*

Surface Equipment 7

Catalog 839 describes over 300 standard items of precision surface equipment. Included are both semi-steel and granite surface plates, semi-steel angle plates, V-blocks, box parallels, straight edges and welding tables. *The Challenge Machinery Co.*

(Please turn page)

Free INFORMATION SERVICE ON

new materials and components

new production equipment

advertiser's products and services

copies of technical literature

Use these postcards for Free Literature listed on these pages, or for more information on New Production Equipment and New Products advertised and described editorially in this issue.

USE FREE READER SERVICE CARDS

FIRST CLASS
Permit No. 36
New York, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed In the United States

POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES
P. O. Box 66,
Village Station,
Readers Service Dept. **New York 14, N. Y.**

Postcard valid 8 weeks only. After that use own letterhead fully describing item wanted. **1/15/59**

Please send further information on items circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300

YOUR NAME ..... TITLE.....

COMPANY .....

PLANT ADDRESS .....

CITY ..... ZONE..... STATE.....

Free INFORMATION SERVICE

FREE LITERATURE—*Continued*

Hose Assembly 8

Bulletin 4501 covers a line of hose assemblies with permanently attached ends for industrial applications. The assemblies, known as Krimp-lok, are complementary to reuseable Hoze-lok fittings and industrial hose. *Parker Fittings & Hose Div., Parker Hannifin Corp.*

Aluminum Forgings 9

A 36 page booklet discusses the equipment, products, and services of Alcoa plants which regularly produce aluminum and magnesium forgings. Forging facilities described range from a 50,000 ton hydraulic press to forging hammers, upsetters, a ring roller, and one of the world's largest die shops. *Aluminum Co. of America.*

Enclosed Switches 10

Catalog 83c covers a complete line of industrial enclosed switches. It gives complete details of nine housing groups of metal-enclosed switches for industrial uses. *Micro Switch a Div. of Minneapolis-Honeywell Regulator Co.*

Fastener Information 11

A simple fastener recognition bulletin is being offered by the Standard Pressed Steel Co. Putting names to the shapes of more than 70 different types which are normally specified for aircraft, missile, engine and related applications only by their national standard (NAS, AN, MS) designations, the literature spot-illustrates each with identifying front- and side view sketches—then tells what type fastener it is.

Parts Washer 12

Bulletin 574 covers a high-level parts washer for parts that roll. The unit is specifically designed for automated gear processing lines and is used without part elevators being required. It washes and blows off up to 950 parts per hour. *Gear-O-Mation Div., Michigan Tool Co.*

Hard-Gear Finishing 13

Abrasive hard-gear finishing is a process for correcting the heat-treat imperfections (nicks, burrs, scales, etc.) of external gears. Bulletin 999, four pages, describes the process and a machine developed to do the job. *Michigan Tool Co.*

Temperature Indicators 14

Five specification sheets describe a line of temperature indicators, controllers and transmitters for temperatures ranging from —400 to 1000 F. Sheets 12-1451T-1 to 5. *Fischer & Porter Co.*

Aluminum Alloys 15

Design information on architectural applications of aluminum is available in a 12 page brochure offered by the *Metals Div., Olin Mathieson Chemical Corp.*

Vibrating Feeders 16

Bulletin 5807, issued by The Arthur G. Russel Co., Inc., regarding the Vibro Block Adjustable Vibrating Feeder, includes length, width, depth, weight, and exclusive features which are contributory to making the Vibro Block unit a fast and precise feeder.

Postcard valid 8 weeks only. After that use own letterhead fully describing item wanted. **1/15/59**

Please send further information on items circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300

YOUR NAME .....TITLE.....

COMPANY .....

PLANT ADDRESS .....

CITY .....ZONE.....STATE.....

FIRST CLASS
Permit No. 36
New York, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES

P. O. Box 66,

Village Station,

Readers Service Dept. New York 14, N. Y.

ORDER YOUR
NEW SUBSCRIPTION Now!

FREE LITERATURE—
continued

Thread Rolling 17

Bulletin I-400-2 on Lanroll thread rolling attachments contains all the necessary information on operation and repair parts and includes dimension charts of each diameter and pitch, maximum bar and hex bar sizes, penetration rates, etc. for bolt, straight pipe and taper pipe applications for the five sizes of attachments. *Landis Machine Co.*

Regulator 18

Bulletin 6.04, six pages, describes a 60-finger regulator for direct control of voltage of main fields of large alternators and generators; line load regulation; power amplification; impedance matching; and system stabilization. *Electric Regulator Corp.*

Electrification System 19

Bulletin 75, 44 pages covers a 100 amp steel-enclosed trolley busway industrial electrification system. *Feedrail Corp.*

Die Thread Roller 20

Bulltin B111 is available giving complete information on the Reed Model B111 two-die type horizontal cylindrical die thread rolling machine. *Reed Rolled Thread Die Co.*

Test Point Connectors 21

An illustrated six page brochure gives specifications, outline dimensions and general information on printed circuit test point connectors. *DeJur-Amsco Corp.*

Industrial Filters 22

Information about a line of industrial filters is given in a four page brochure. These filters were developed primarily for corrosive fluids but show promise in the fields of flow control, gas diffusion and purification. *Corning Glass Works.*

(Please turn page)

AUTOMOTIVE INDUSTRIES

SUBSCRIPTION ORDER FORM

Subscription Price: To manufacturers in and suppliers to the automotive industries in the U. S., U. S. possessions and Canada, $2.00 per year; $3.00 for 2 years. ALL OTHERS, $10.00 per year.

Please enter my subscription to Automotive Industries for:

☐ $3.00 for Two Years ☐ $2.00 for One Year ☐ $10.00 for One Year

NAME..... TITLE .....

COMPANY NAME .....

PLANT ADDRESS .....

CITY & STATE .....

PRODUCT MANUFACTURED .....

☐ Payment enclosed ☐ Bill me ☐ Bill Company

IMPORTANT—Please fill in completely. We cannot enter your subscription without this data.

AUTOMOTIVE INDUSTRIES

SUBSCRIPTION ORDER FORM

Subscription Price: To manufacturers in and suppliers to the automotive industries in the U. S., U. S. possessions and Canada, $2.00 per year; $3.00 for 2 years. ALL OTHERS, $10.00 per year.

Please enter my subscription to Automotive Industries for:

☐ $3.00 for Two Years ☐ $2.00 for One Year ☐ $10.00 for One Year

NAME..... TITLE .....

COMPANY NAME .....

PLANT ADDRESS .....

CITY & STATE .....

PRODUCT MANUFACTURED .....

☐ Payment enclosed ☐ Bill me ☐ Bill Company

IMPORTANT—Please fill in completely. We cannot enter your subscription without this data.

Postcard valid 8 weeks only. After that use own letterhead fully describing item wanted. **1/15/59**

Please send further information on items circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300

YOUR NAME .....**TITLE**.....

COMPANY .....

PLANT ADDRESS .....

CITY .....**ZONE**.....**STATE**.....

Free INFORMATION SERVICE

FREE LITERATURE — *Continued*

FIRST CLASS
Permit No. 18
Philadelphia 39, Pa.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES

Chestnut & 56th Sts.

Philadelphia 39, Pa.

FIRST CLASS
Permit No. 18
Philadelphia 39, Pa.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES

Chestnut & 56th Sts.

Philadelphia 39, Pa.

FIRST CLASS
Permit No. 36
New York, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES

P. O. Box 66,

Village Station,

Readers Service Dept. New York 14, N. Y.

Urethane Guide 23

New research material which includes calculations needed in urethane technology and which will serve as reference matter is contained in a brochure published by Allied Chemical's National Aniline Div. Technical Terms are described.

Recording, Processing 24

Two basic systems for recording and processing the multitude of strains required to evaluate complex structual systems in laboratory and industrial applications and tabulate strains on a typewriter, IBM cards or punched tape are illustrated and described in a four page folder issued by B & F Instruments, Inc.

Cut-Off Equipment 25

Bulletin W-100 covers Wink cutting machines and equipment. This is a line of high-speed rubber and plastic cut-off equipment for use in automotive, industrial, aircraft and related industries. *The Motch & Merryweather Machinery Co., Wink Cutter Div.*

Lapping-Polishing Unit 26

Syntron Co. announces publication of a catalog section on vibratory lapping-polishing machines which provide mechanical polishing of metallurgical samples for microscopic examination and a fatigue-reducing means of lapping metal parts for mating purposes.

Welded Assemblies 27

Designers, engineers and other industrial personnel charged with specifying and buying welded assemblies will find a valuable guide in the 60 page catalog published by the American Welding And Mfg. Co.

Dial Thermometers 28

Catalog 205, 12 pages, describes a redesigned line of indicating dial thermometers offered by U. S. Gauge, Div. of American Machine and Metals, Inc. for temperature measurements in the range of —40 to 1000 F.

The "Long Life" Piston with Cast-Anchored Steel Top Ring Section

CONTINUOUS PERMA-GROOVE*



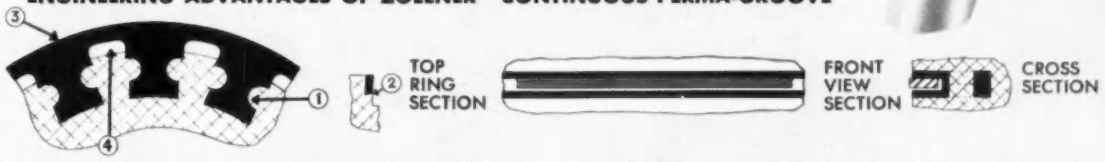
SUPERIOR PERFORMANCE FOR GASOLINE ENGINES

- ★ HIGHEST WEAR RESISTANCE
- ★ COOL OPERATION
- ★ MINIMUM OIL CONSUMPTION
- ★ MINIMUM WEIGHT INCREASE
- ★ ECONOMICAL IN COST
- ★ ADAPTABLE TO ANY TYPE PISTON

We suggest an immediate test of "Continuous Perma-Groove" advantages for your gasoline engine.

*T.M. Reg. Pat. App. For

ENGINEERING ADVANTAGES OF ZOLLNER "CONTINUOUS PERMA-GROOVE"



1. Cast-anchored—no bimetal expansion problem.
2. Dovetailed edges keep insert securely in place.
3. 100% steel bearing area for wear resistance.
4. 40% aluminum bearing area exposed for heat conductivity and cool operation.
5. Light in weight.

Advanced Engineering

Precision Production

Cooperation with Engine Builders

ZOLLNER PISTONS

THE ORIGINAL EQUIPMENT PISTONS

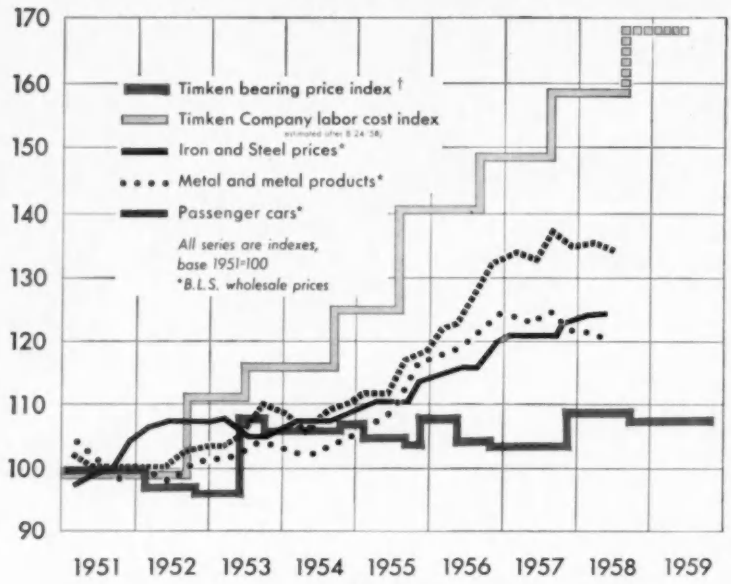
ZOLLNER

ZOLLNER CORPORATION • Fort Wayne, Indiana

Circle 102 on Inquiry Card for more data

Here's one cost chart that's good news

The good news in this chart is the bottom line. It shows how the cost of Timken® tapered roller bearings for automobiles has stayed down while the cost of almost everything else was rising sharply. Automakers helped us draw the line by switching to the new design Timken bearings. The bearings made by revolutionary methods in the world's most modern bearing plant.



† COMPUTED FROM TOTAL VEHICLE COST OF PINION, DIFFERENTIAL, REAR AND FRONT WHEEL BEARINGS.

Here's the picture that'll keep it good

It's the inside of our missile-age bearing plant in Bucyrus, Ohio, that turns out 30 million bearings a year. Custom-built machines convert raw steel to packaged bearings—without a hand touching them. And this new kind of production lets us pass our manufacturing savings on to you. You can *keep* your bearing costs down by doing two things. 1) Standardizing on still fewer Timken bearing sizes so we can stretch out our production runs even more and 2) use more *Timken* bearings and boost the manufacturing savings. *First in bearings for 60 years.* The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".





BEAT INFLATION WITH STANDARDIZATION...

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

Circle 103 on Inquiry Card for more data